

Interaction

DSC 106: Data Visualization

Sam Lau

UC San Diego

Announcements

Project 2 Peer Evaluation form due today (used to be yesterday).

Lab 5 due Friday.

Duncan Watson-Parris will be guest lecturing on Friday about the Project 3 data.

Project 3 team form due Monday.

Project 3 checkpoint due Tuesday.

Project 2 peer grading out, due Tuesday.

FAQs:

Project 2 Peer Feedback

Opportunity to get feedback from your peers.

"I like / I wish / What if?" format.

Worth 1% of your final grade, graded by completion.

Project 3: Interactive Visualization

Choose a climate dataset from the options on the Project 3 webpage.

Create **one** interactive graphic to let readers explore the data.

Must use D3, no other plotting libraries allowed.

Must complete in teams of 3-4.

Pro-tip: Explore lots of options using pen-and-paper. Then, keep scope of project very tight! Do one thing well.

↑ Type a name

Starts with

Ends with

Contains

Exact Match

Girls

Boys

Both

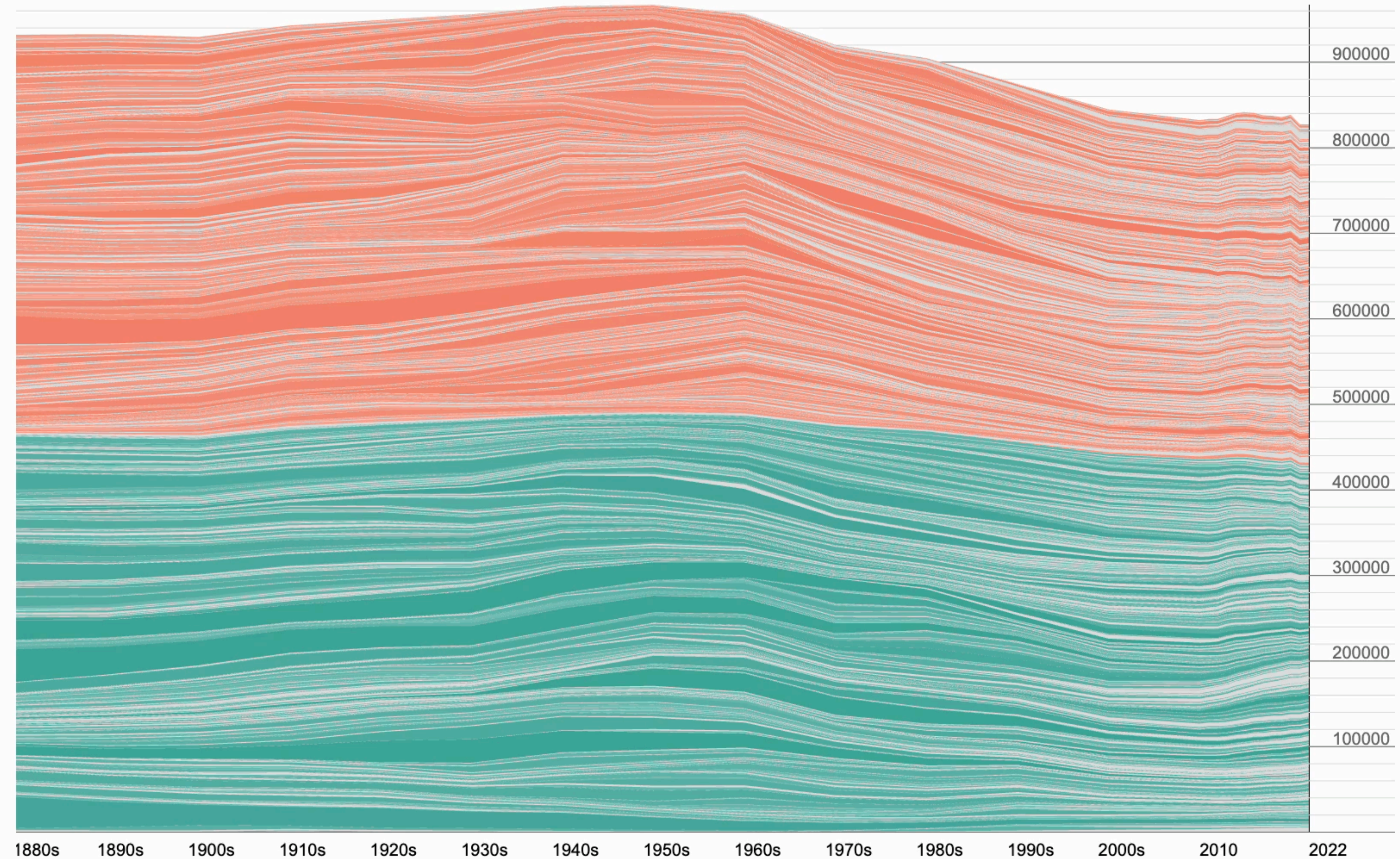


Total



Compare

per million births

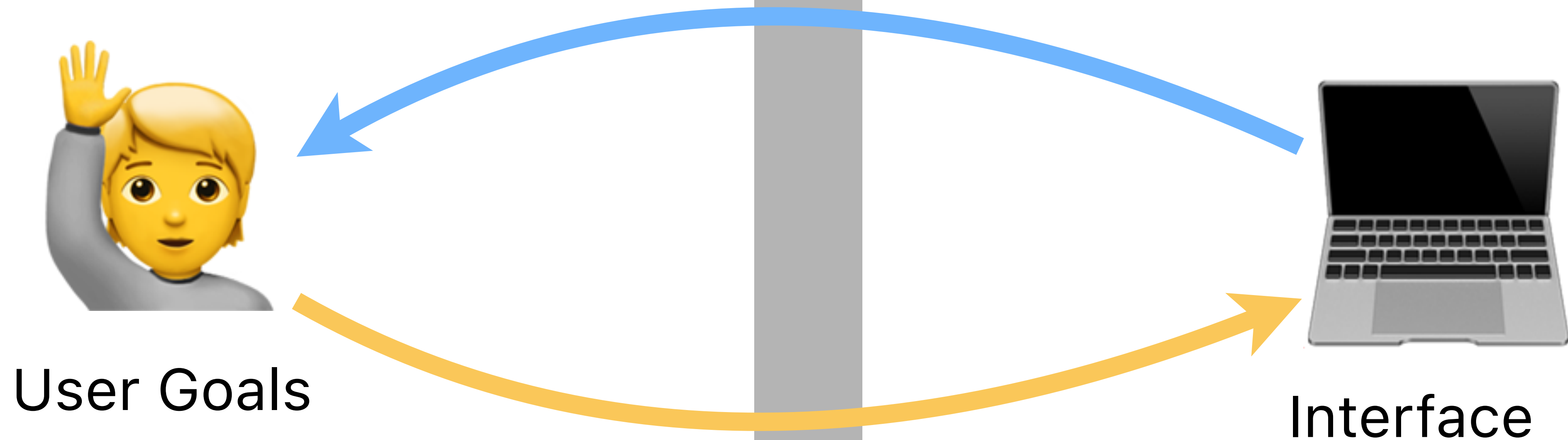


<https://namerology.com/baby-name-grapher/>

Interaction

Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.

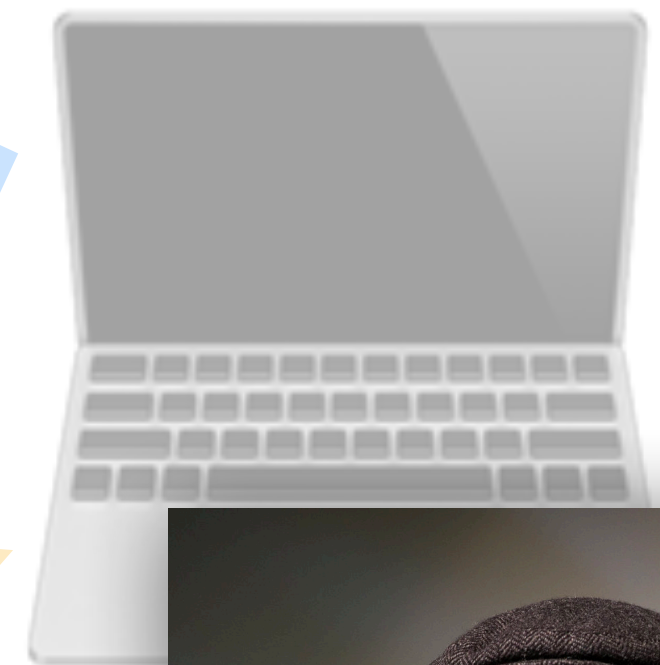


Gulf of Execution

The gap between the user's goals and their ability to achieve them using the system.

Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.



Goals

Inter

Gulf of Execution

The gap between the user's goals and the ability to achieve them by interacting with the system.



Edwin Hutchins



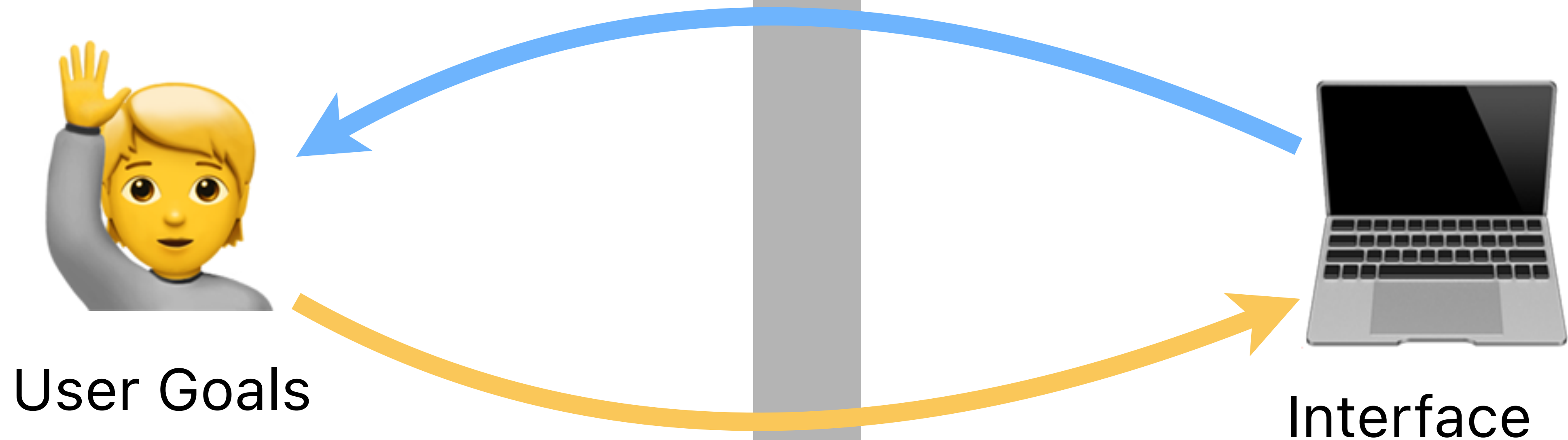
Jim Hollan



Don Norman

Gulf of Evaluation

The level of difficulty in interpreting the system and assessing if goals were met.



Gulf of Execution

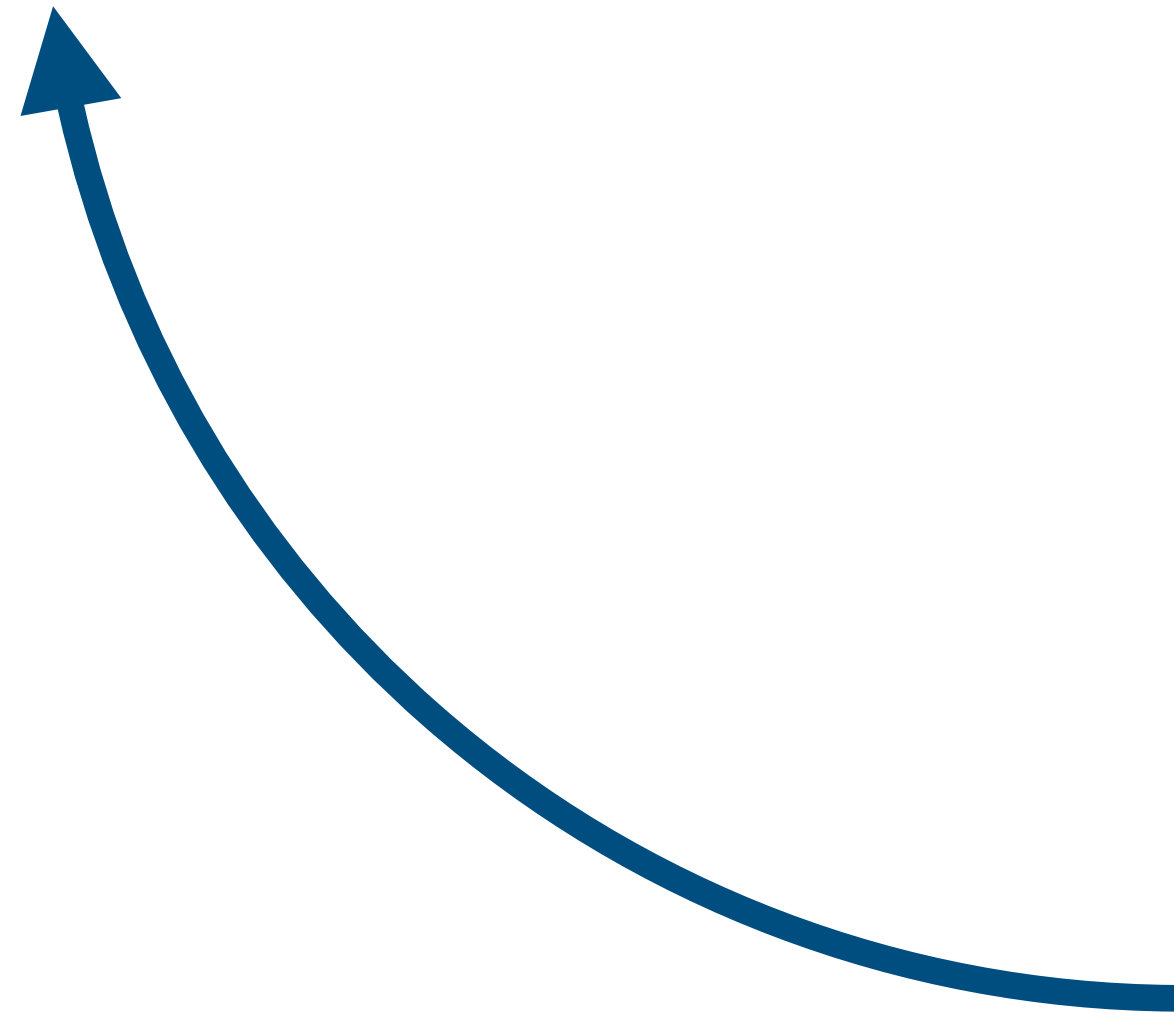
The gap between the user's goals and their ability to achieve them using the system.

day	stock	price
10/3	AMZN	957.10
10/3	MSFT	74.26
10/4	AMZN	965.45
10/4	MSFT	74.69

```
pd.read_csv('stocks.csv')
```


day	symbol	price
10/3	AMZN	957.10
10/4	AMZN	965.45

```
df[df['price'] > 900]
```



day	stock	price
10/3	AMZN	957.10
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df[df['price'] > 900]
```

```
df.sort_values('price',  
ascending=False)
```

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10/4	AMZN	965.45
10/3	MSFT	74.26
10/4	MSFT	74.69

symbol	avg(price)
AMZN	961.275
MSFT	74.475

```
df[df['price'] > 900]
```

```
df.sort_values('price',
ascending=False)
```

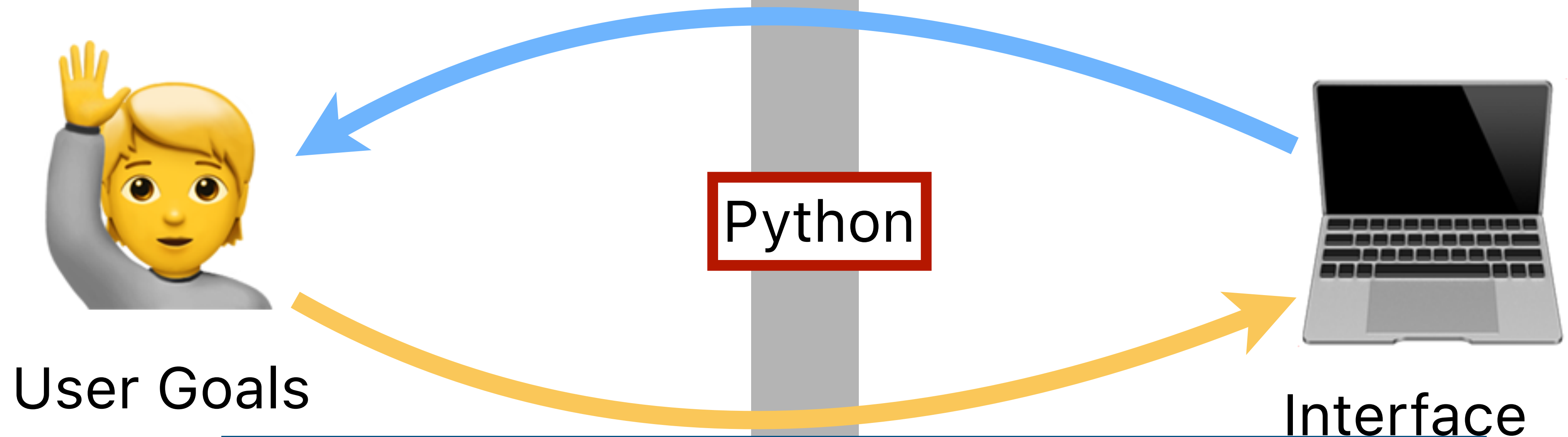
```
df.groupby('symbol')
.mean()
```

day	stock	price
10/3	AMZN	957.10
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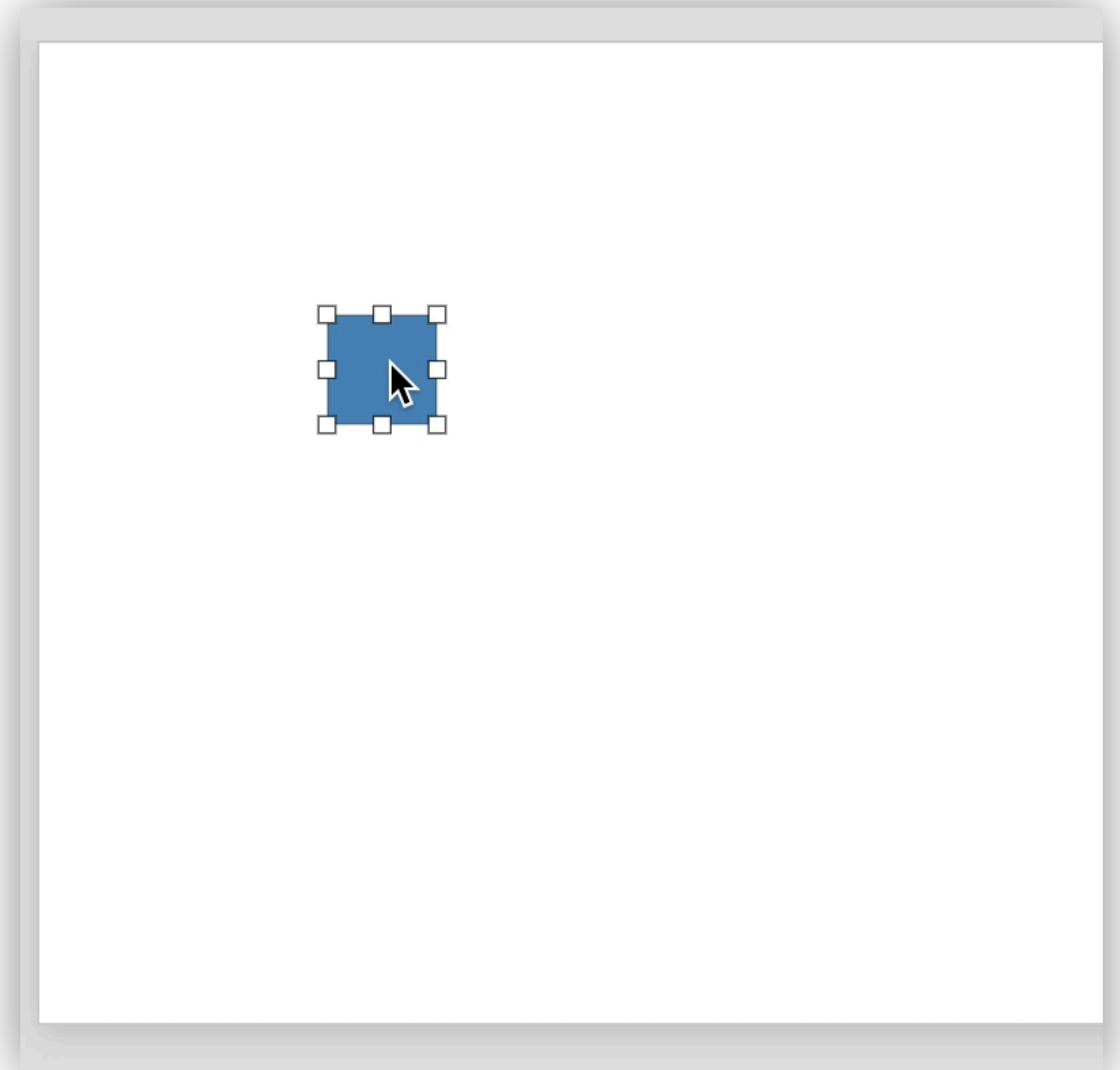
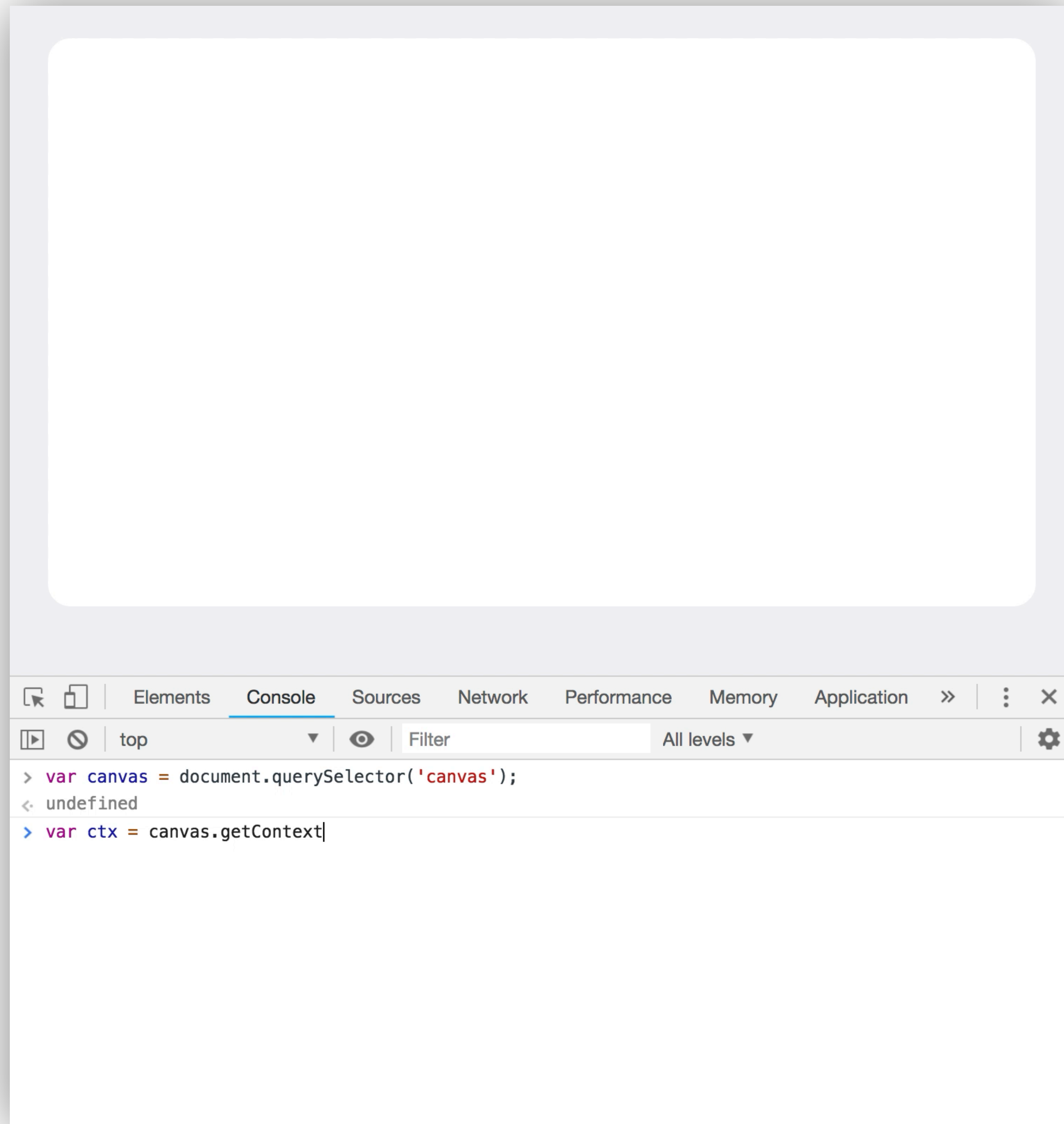
Gulf of Evaluation

- Results returned as a table.
- No hint on how to reformulate query.
- Slow question-answer loop.



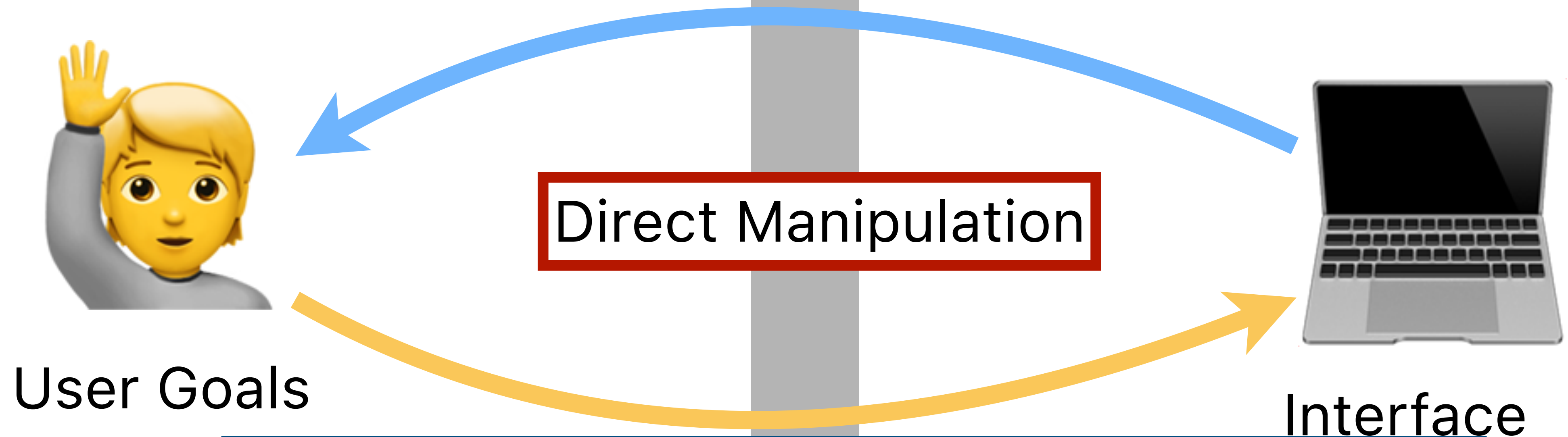
Gulf of Execution

- A rigid syntax designed by/for programmers.
- Difficult to do "fuzzy" matching.



Gulf of Evaluation

- Visual representation of objects + actions.
- Immediate + continuous display of results.



Gulf of Execution

- Physical actions or labeled buttons instead of complex syntax.
- Rapid, incremental, and reversible actions.

Interaction in Visualization

Select identify something as interesting.

Connect show me something conditionally.

Abstract/Elaborate show me related items.

Filter show me more or less detail.

Reconfigure show me a different arrangement.

Explore show me something else.

Encode show me a different visual representation.

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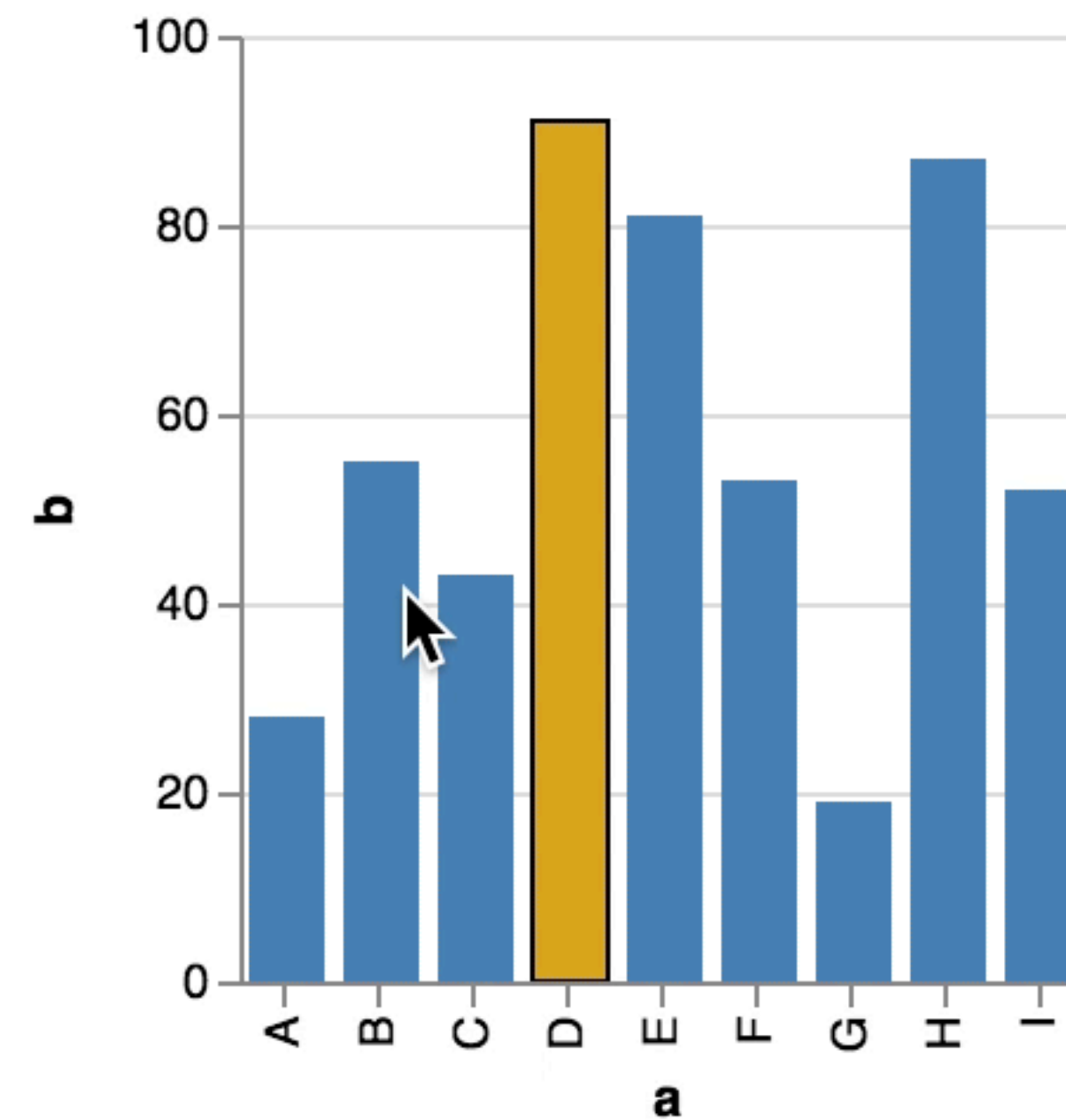
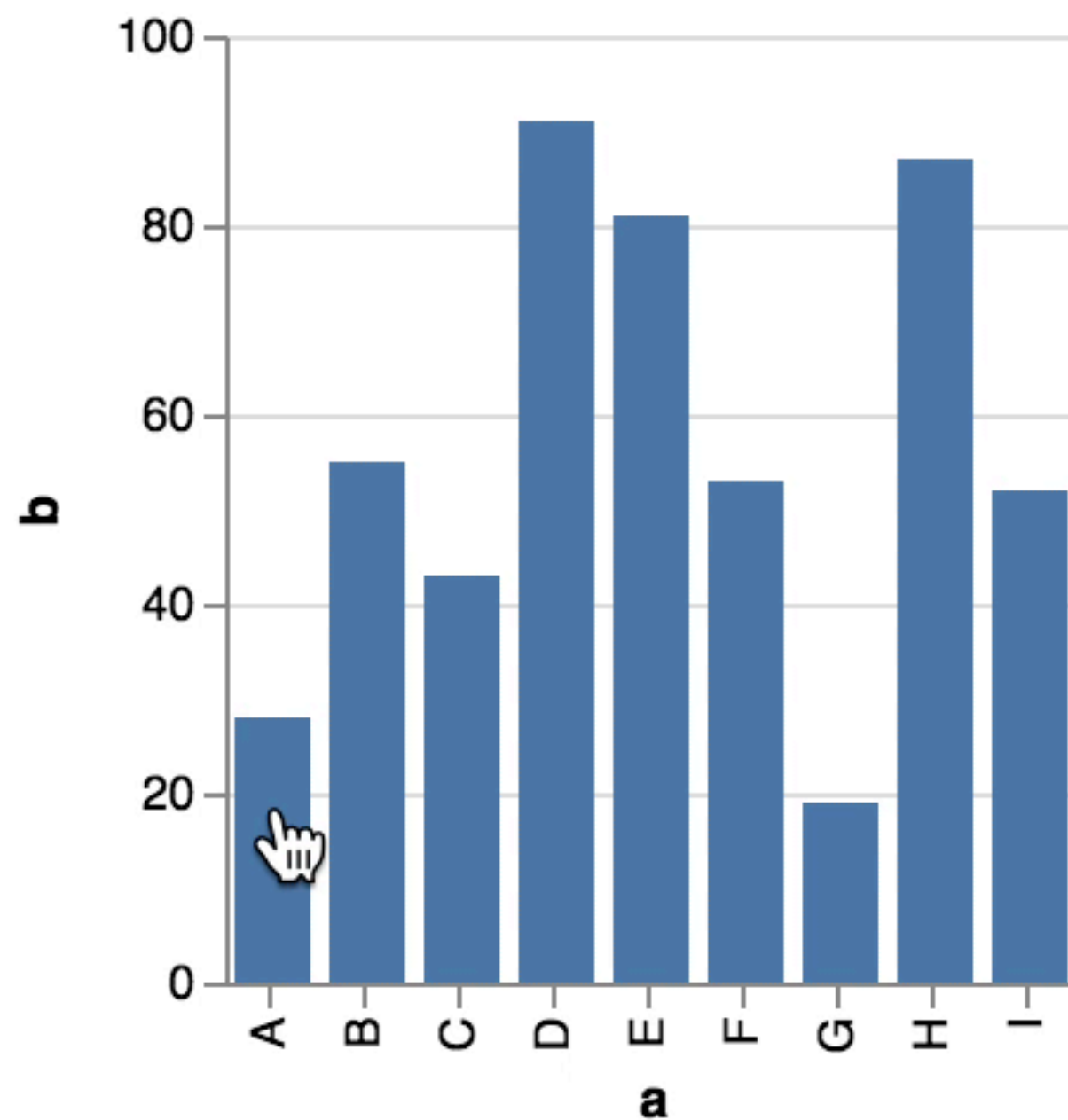
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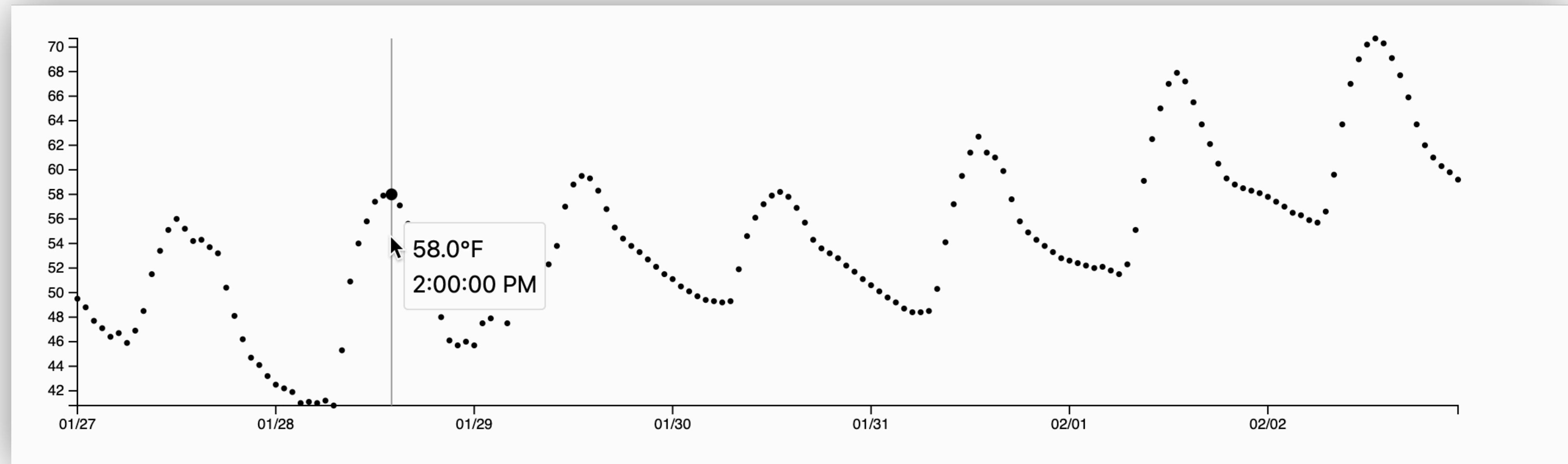
Point Selection

Select discrete data values.

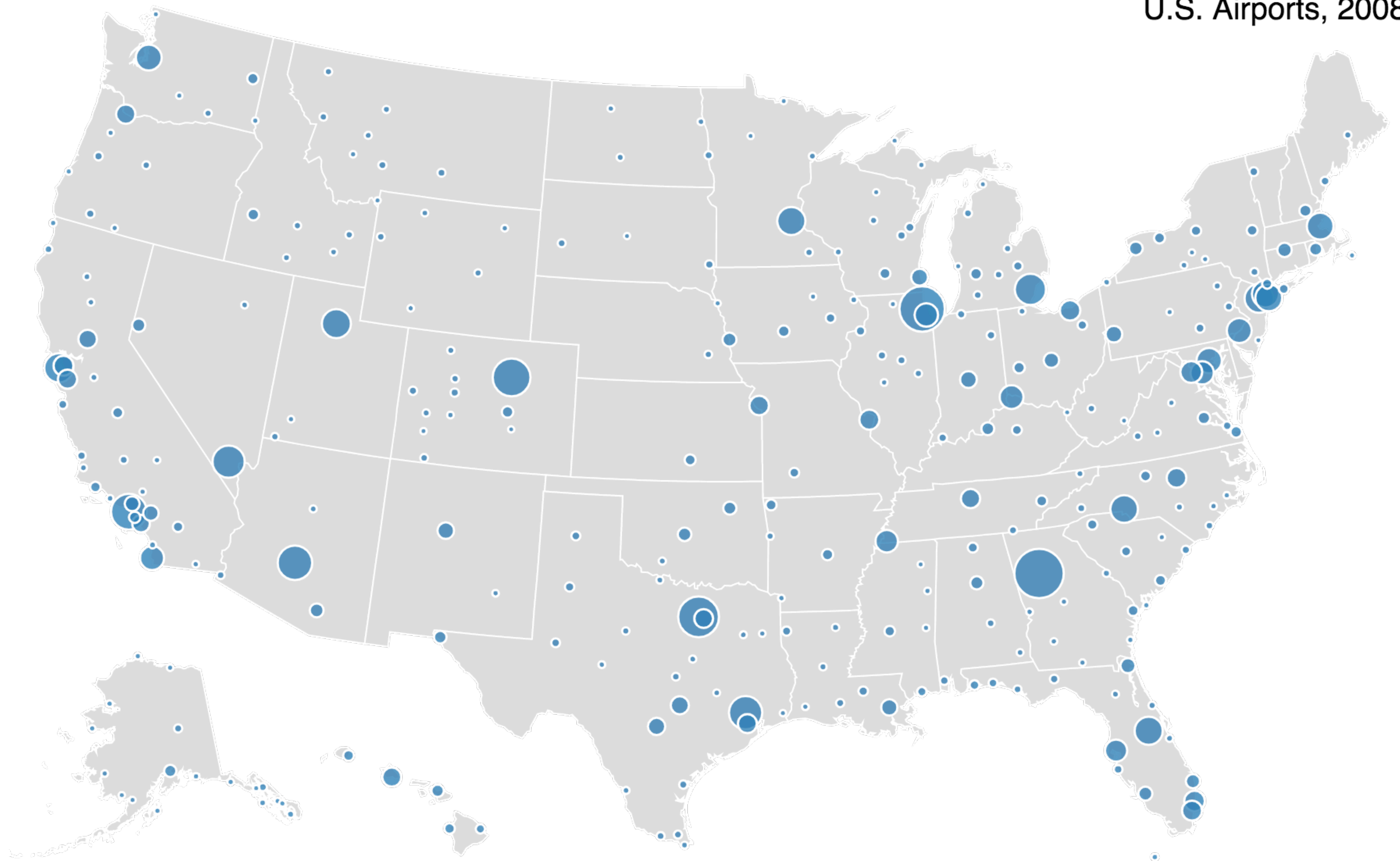
- How many points are selected? 1, 2, 3, ...
- How are points selected? Mouse hover, click, tap, ...



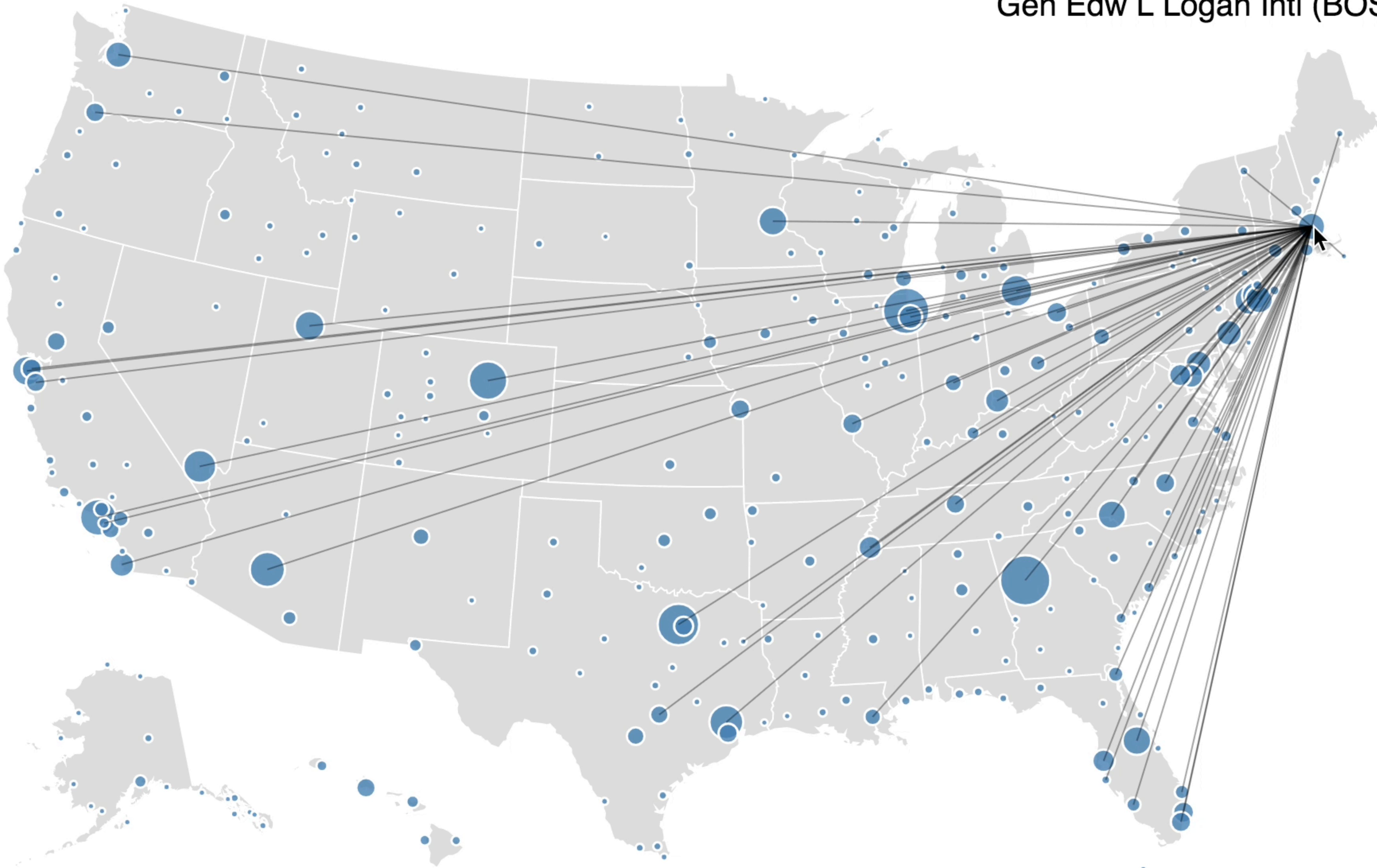
Point Selection



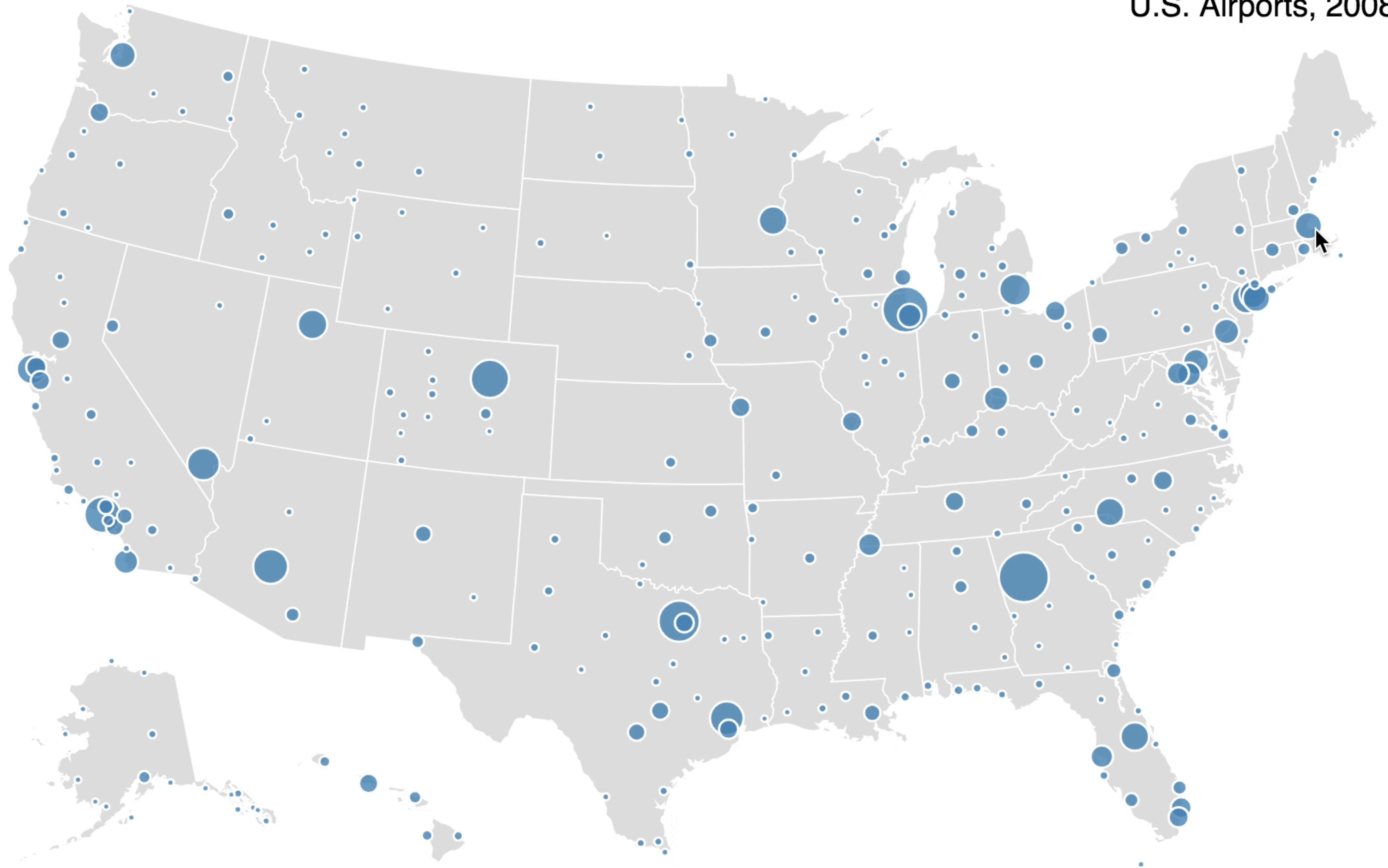
U.S. Airports, 2008



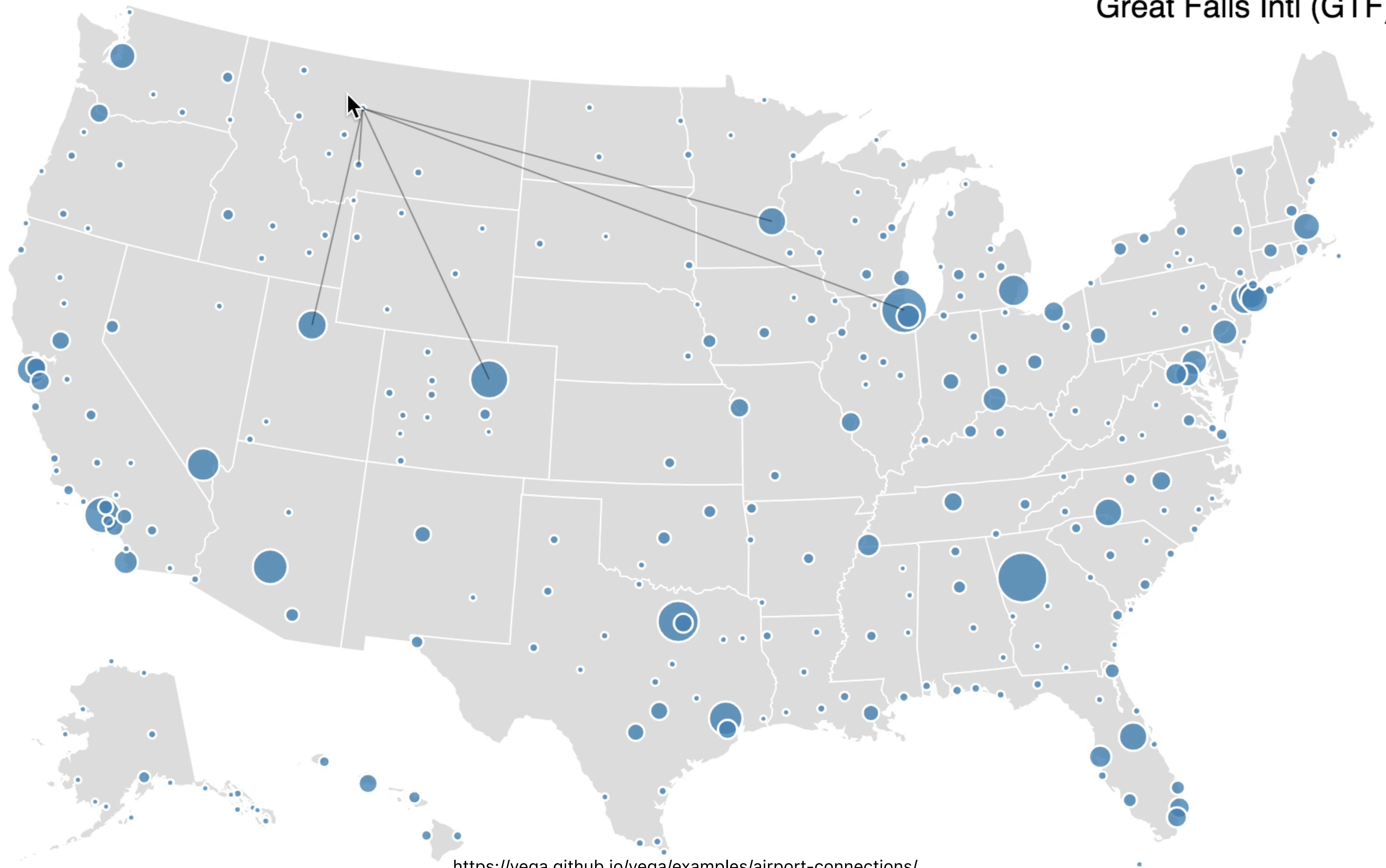
Gen Edw L Logan Intl (BOS)



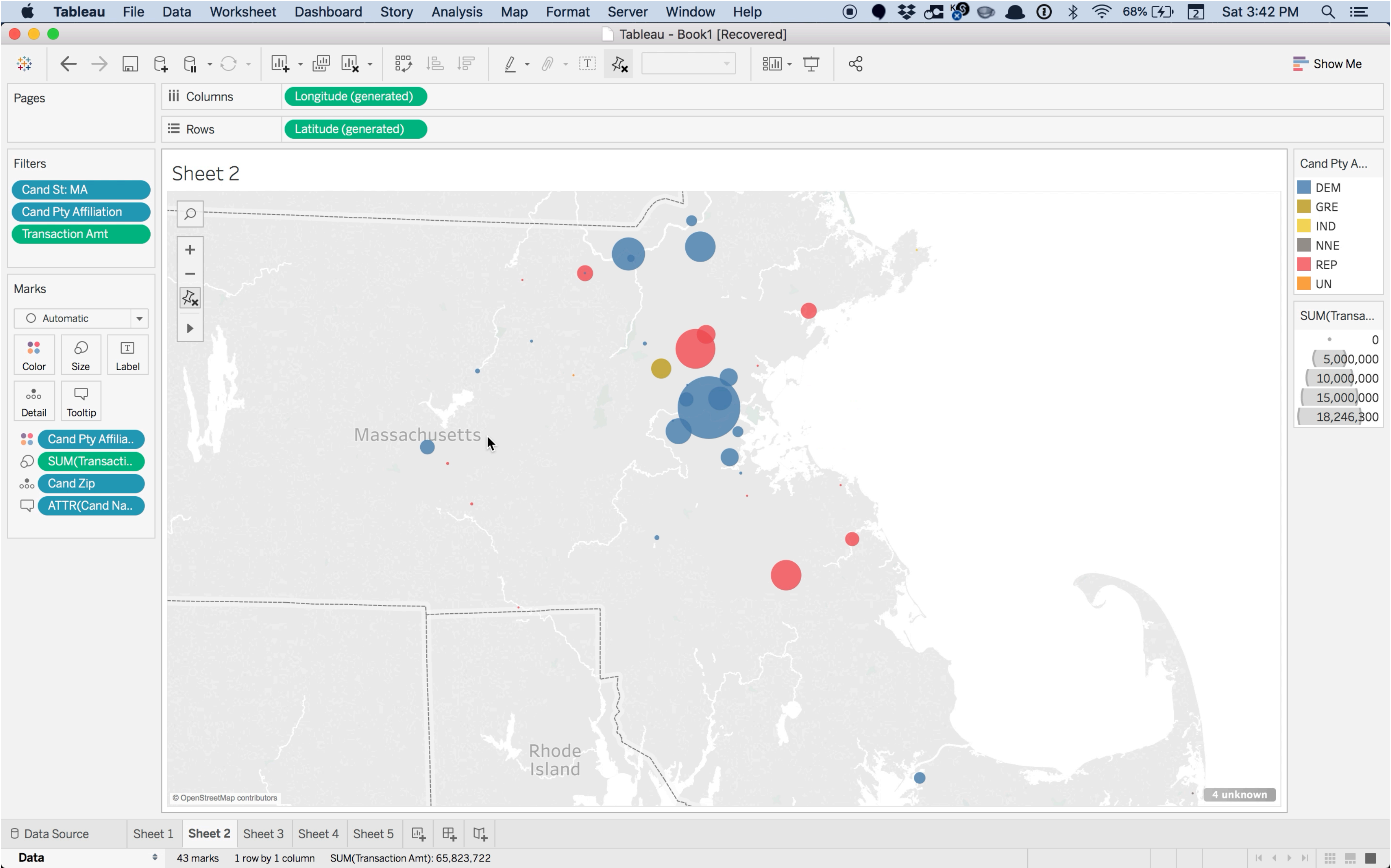
U.S. Airports, 2008



Great Falls Intl (GTF)



Region Selection



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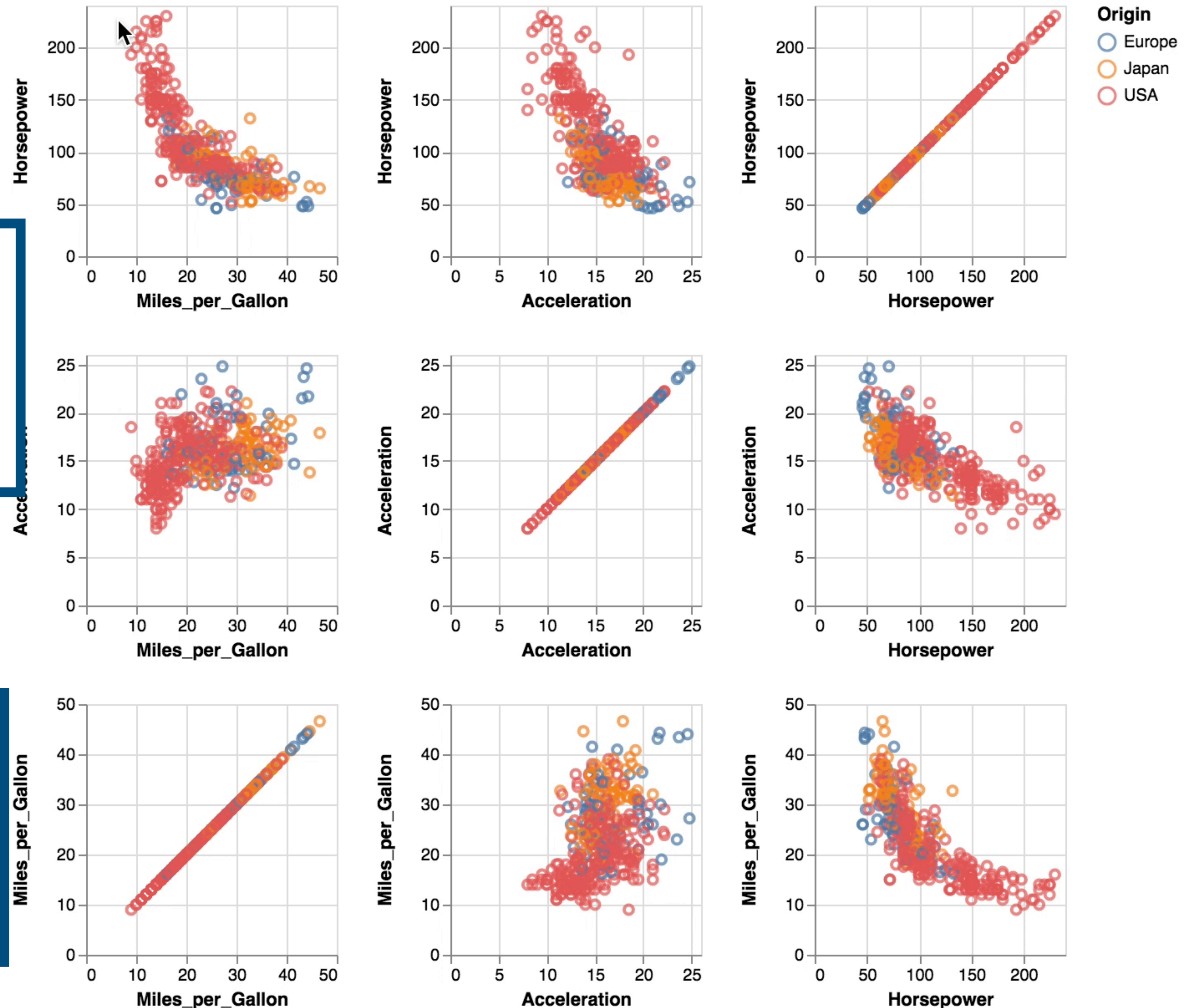
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Connect

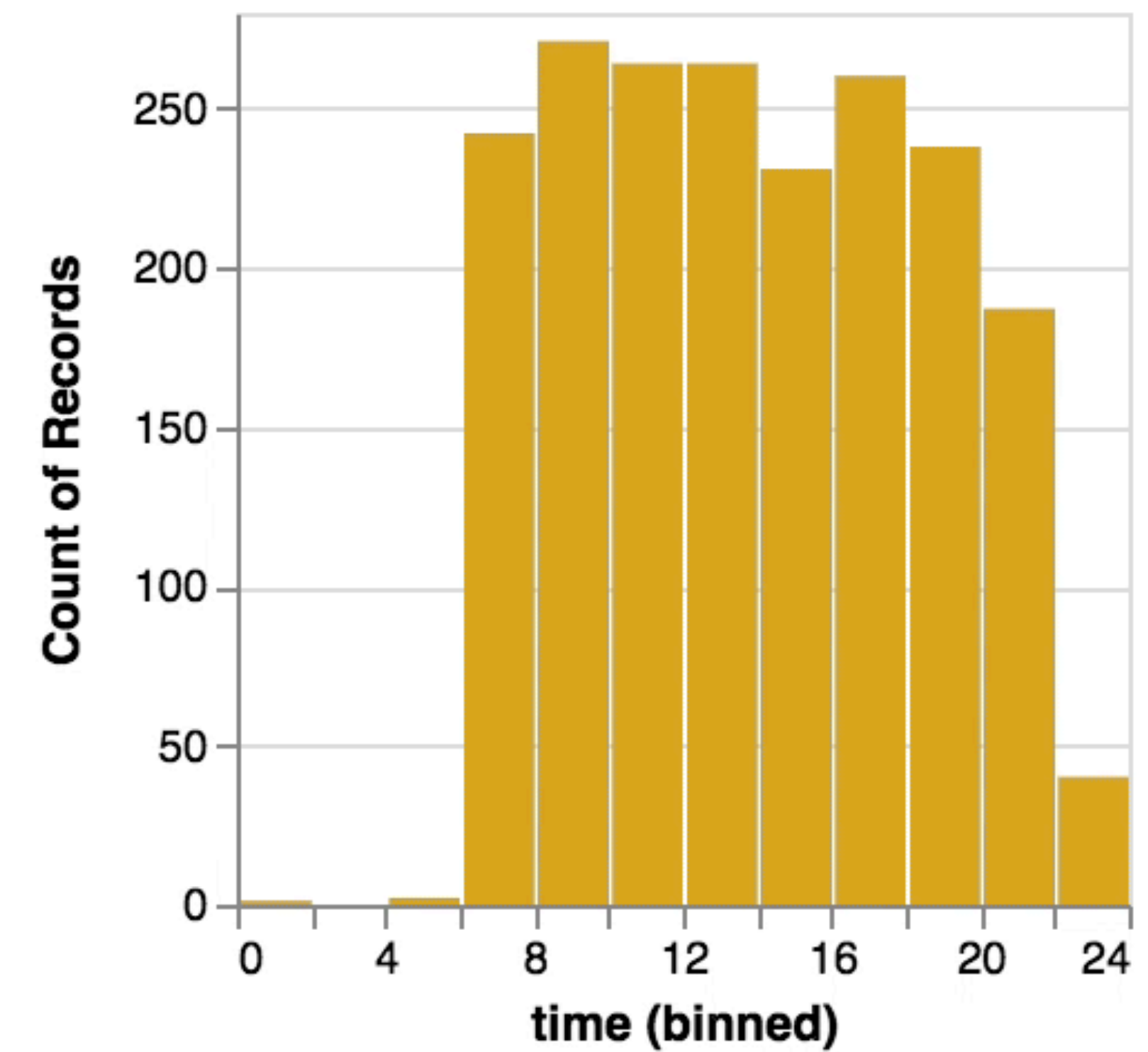
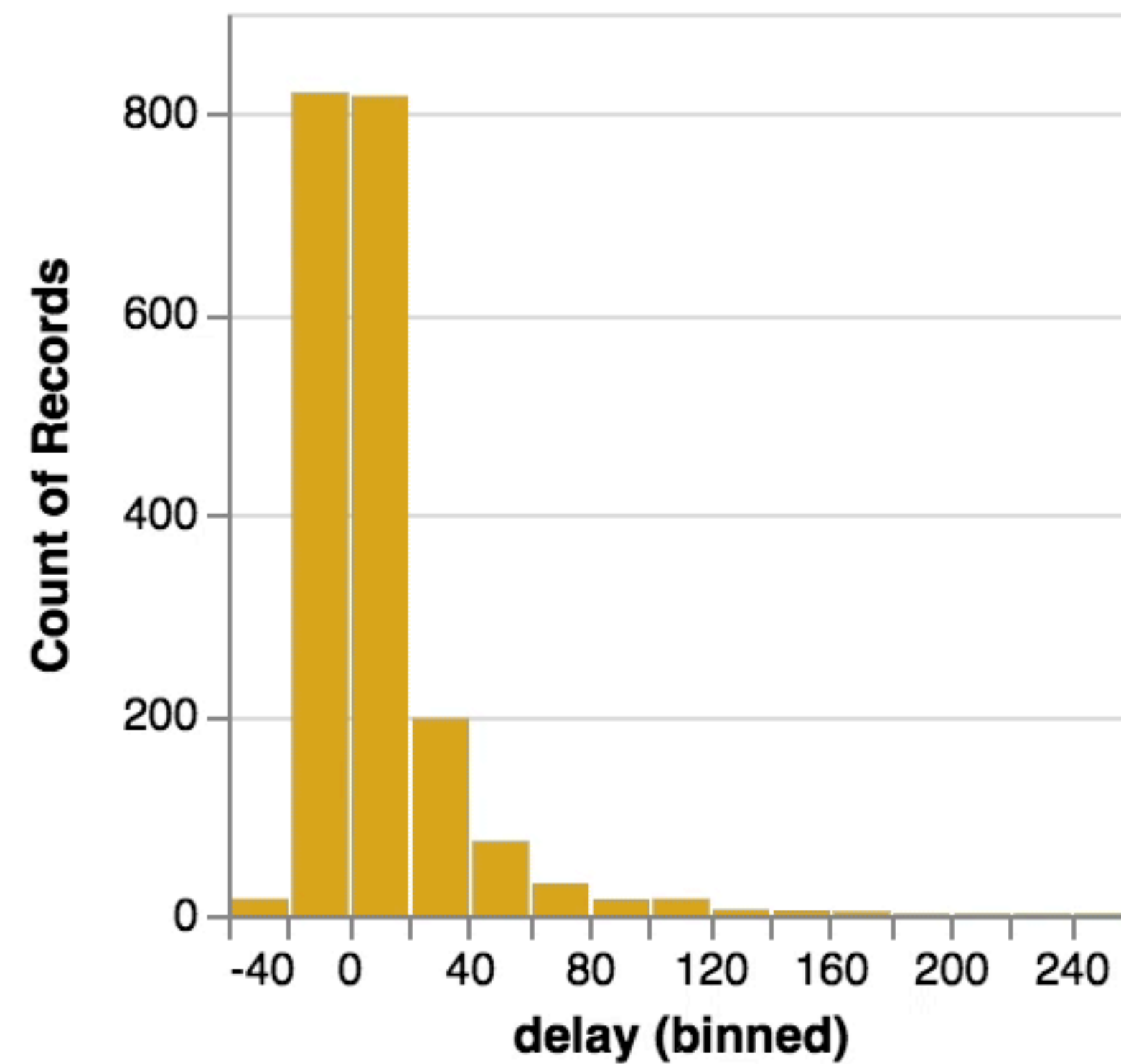
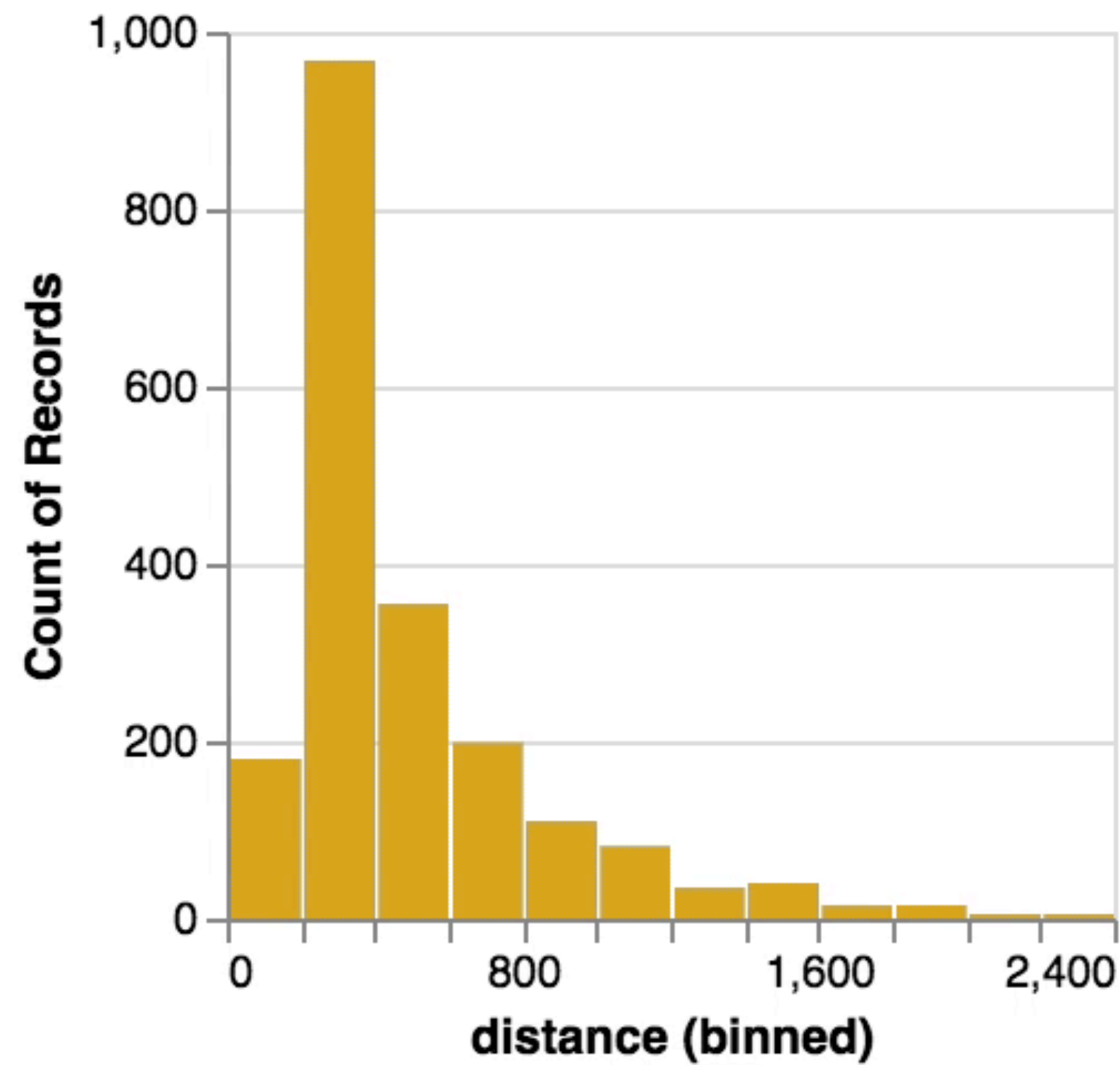
Brushing & linking:
selection = "brush",
selected data "linked" in
other views.

Link by tuple: explicitly
identify and match the
same data values
across every view.



Connect

Link by query: matching range or values of fields.



Connect doesn't have to be just highlighting!

How the Tax Burden Has Changed

Most Americans paid less in taxes in 2010 than people with the same inflation-adjusted incomes paid in 1980, because of cuts in federal income taxes. At lower income levels, however, much of the savings was offset by increases in federal payroll taxes, state sales taxes and local property taxes. About half of households making less than \$25,000 saved nothing at all. [About the Data »](#) | [Related Article »](#)

\$0-25k

\$25-50k

\$50-75k

\$75-100k

\$100-125k

\$125-150k

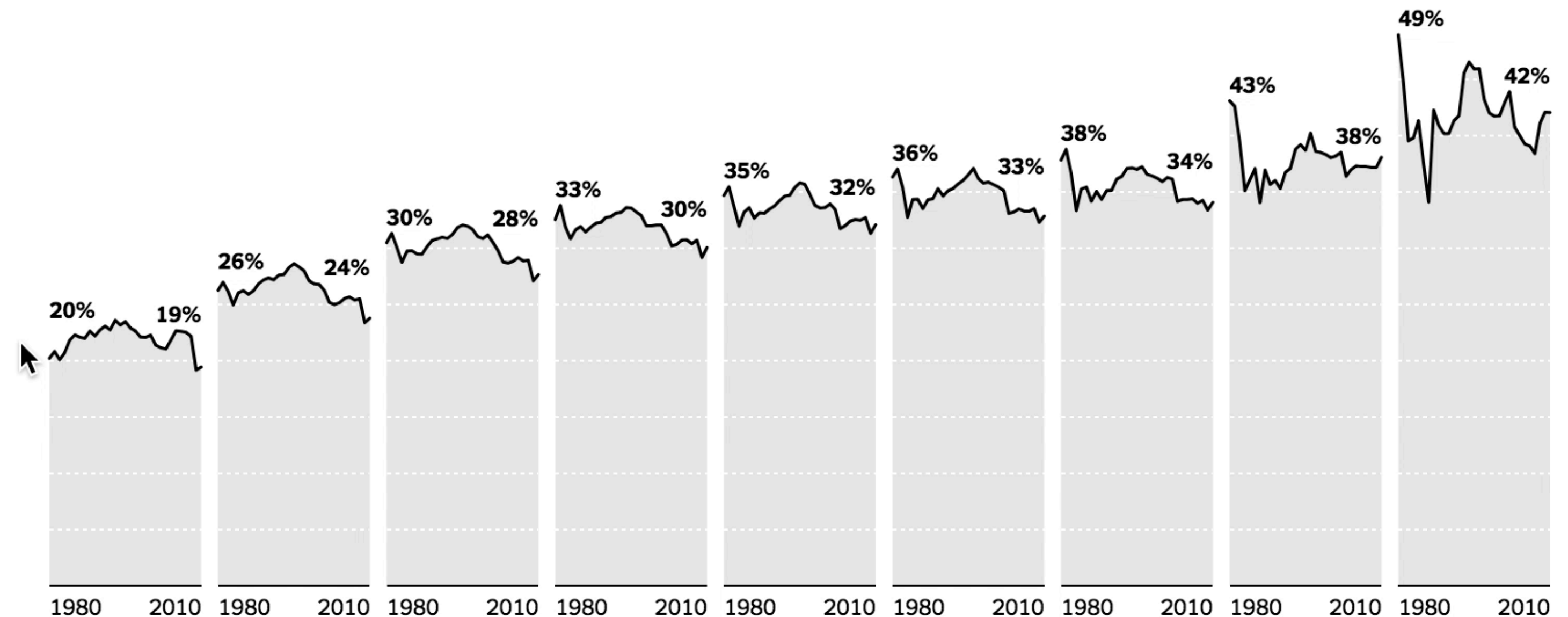
\$150-200k

\$200-350k

\$350k+

Tax rates have fallen for most Americans, especially high earners.

Share of yearly income paid in federal, state and local taxes, by income bracket.



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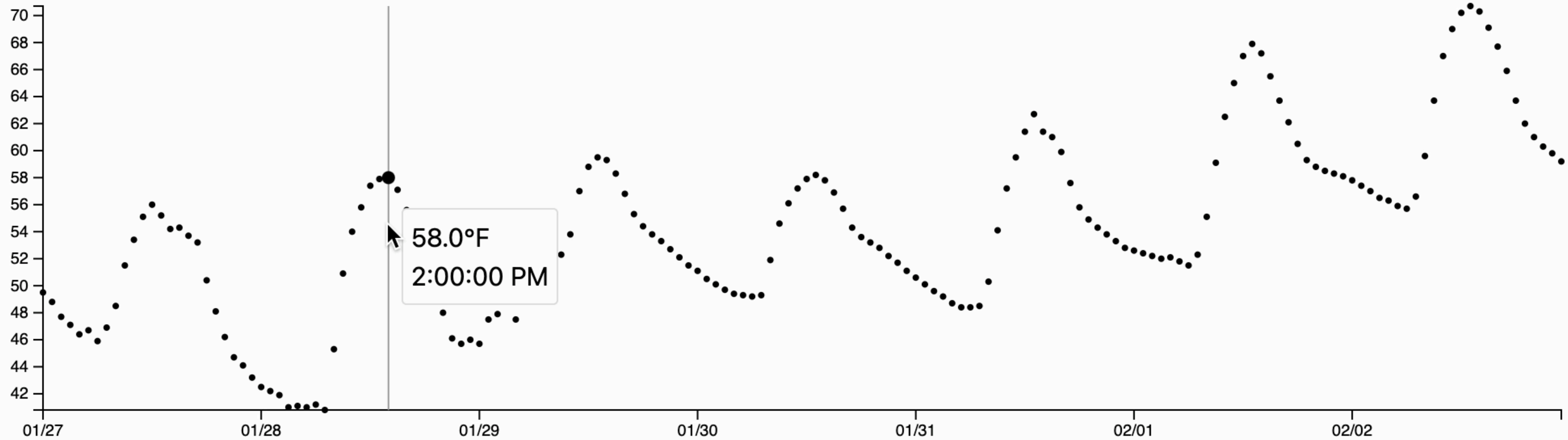
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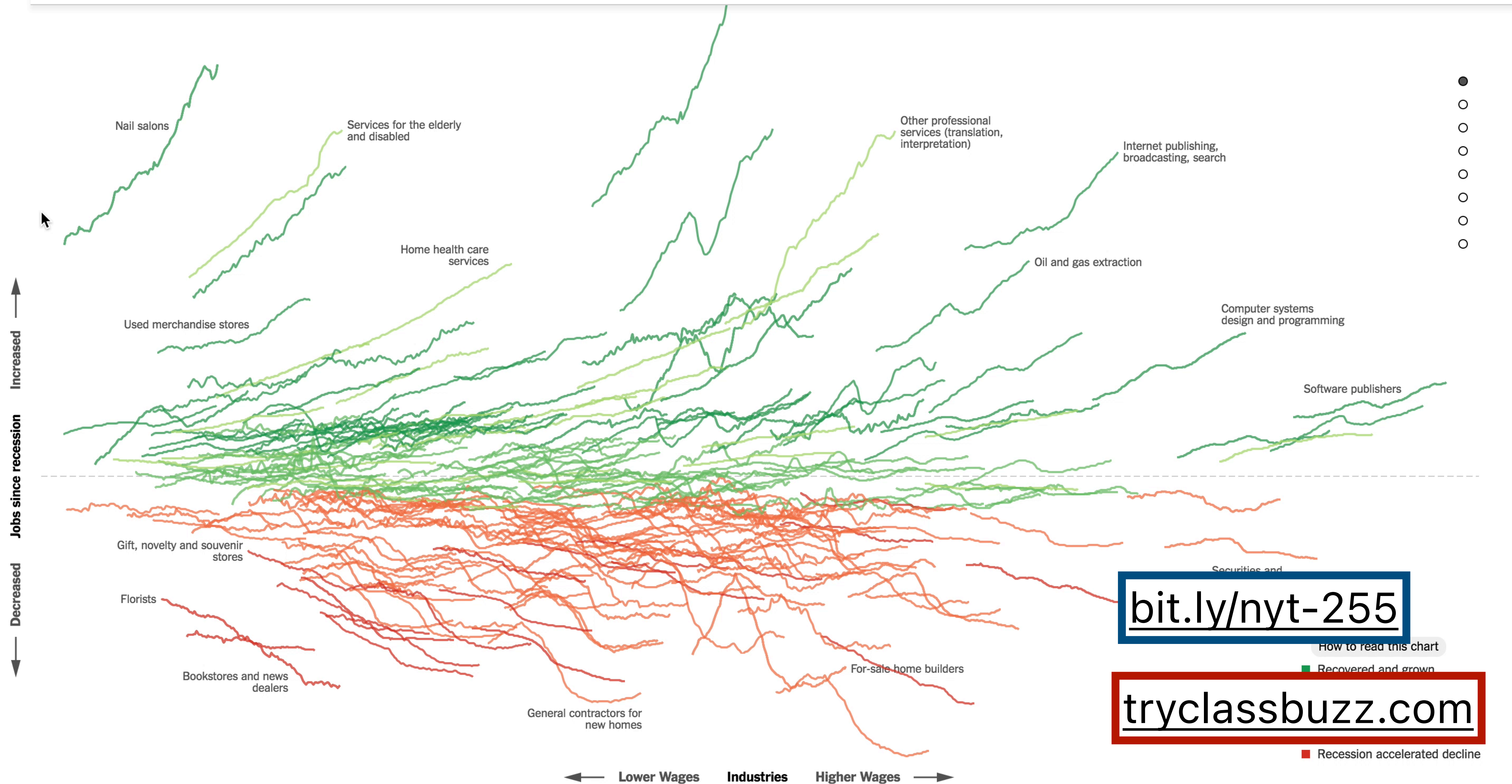
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Elaborate

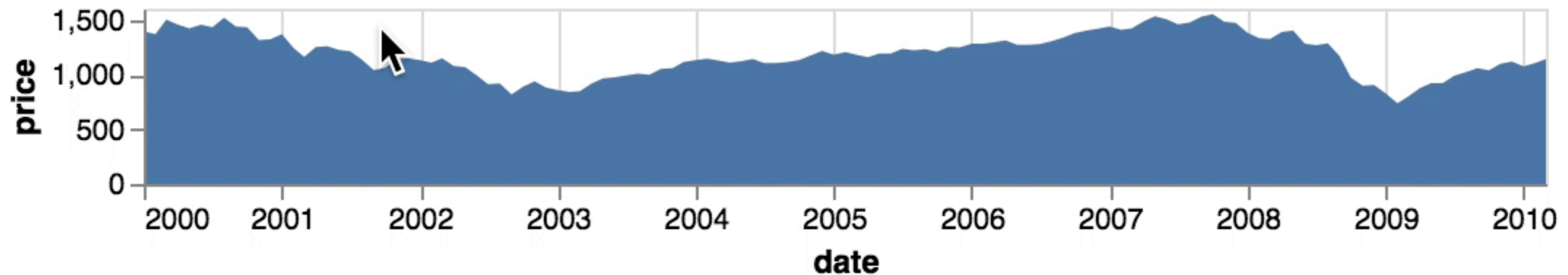
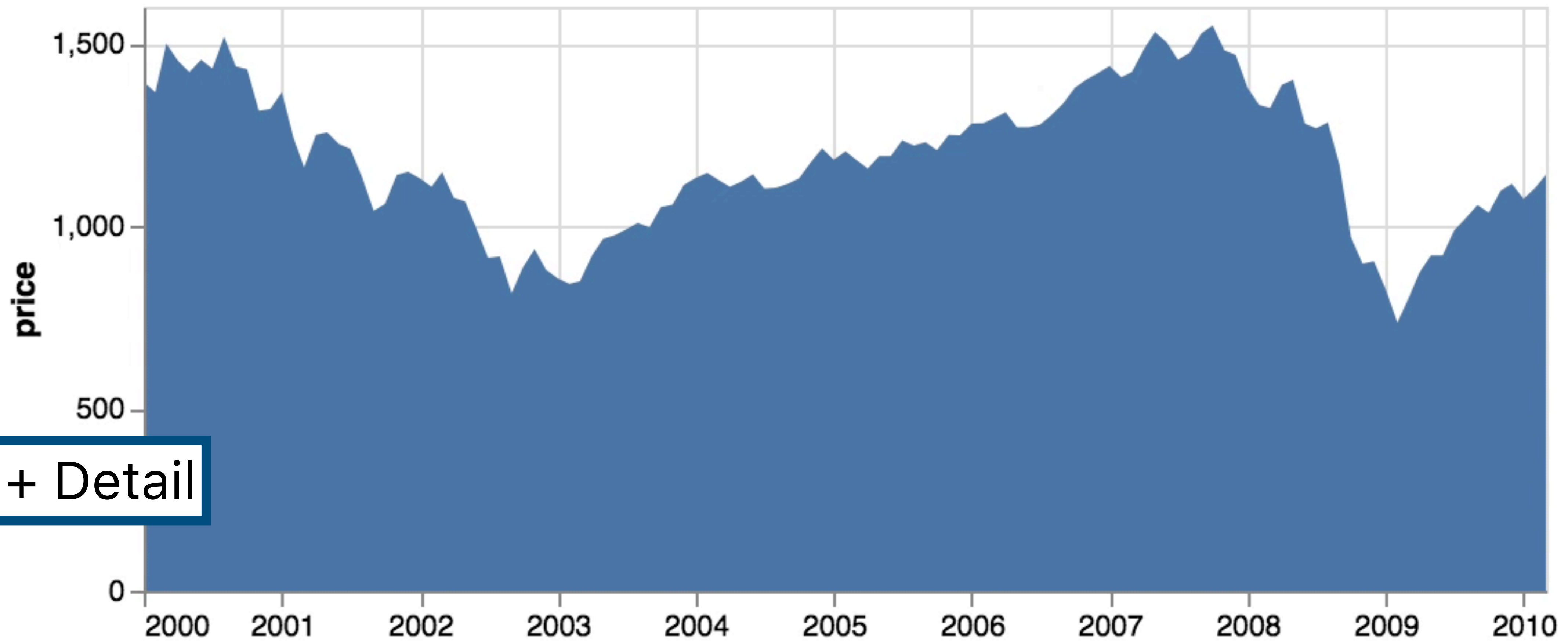


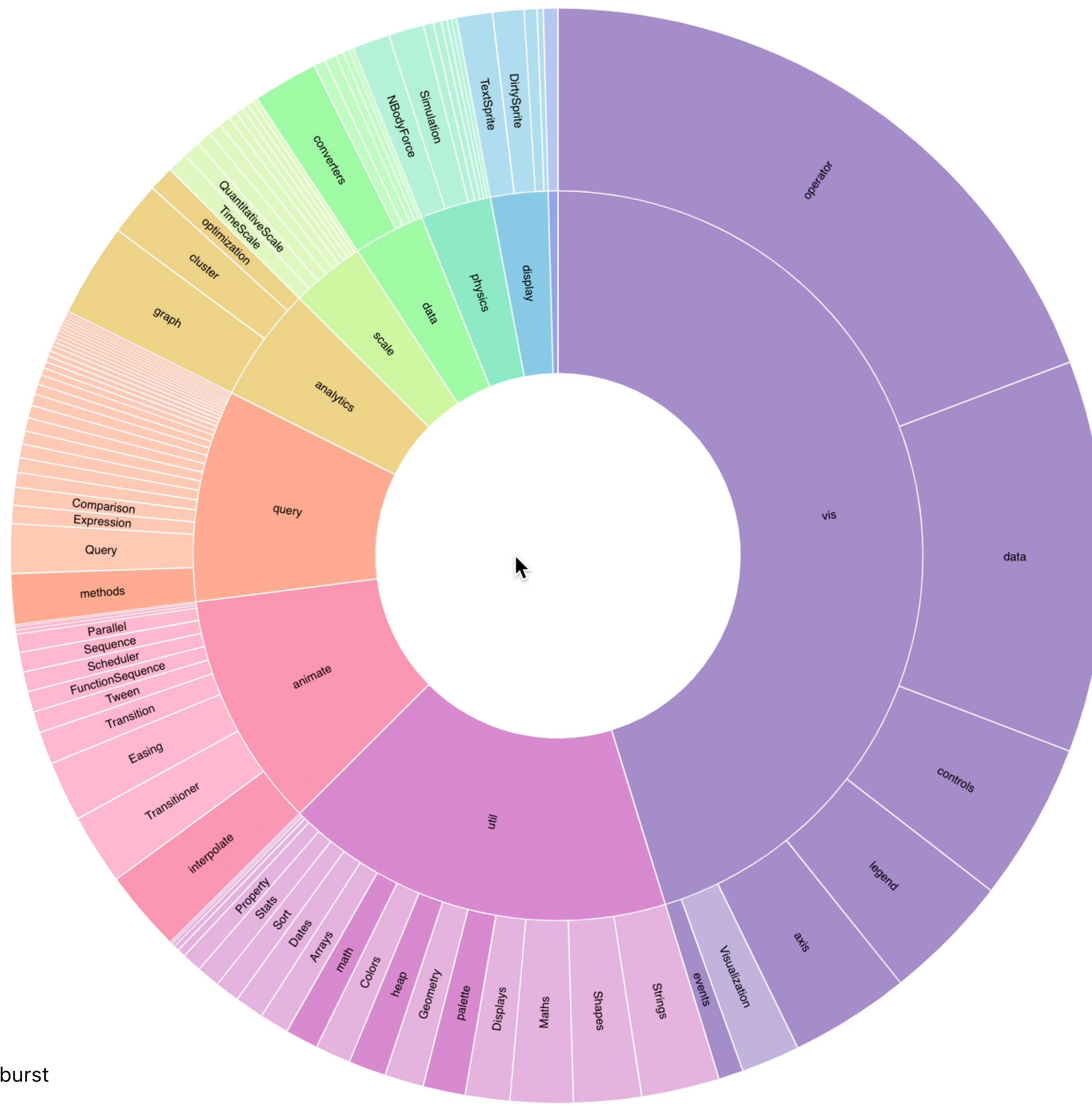


bit.ly/nyt-255

tryclassbuzz.com

Overview + Detail





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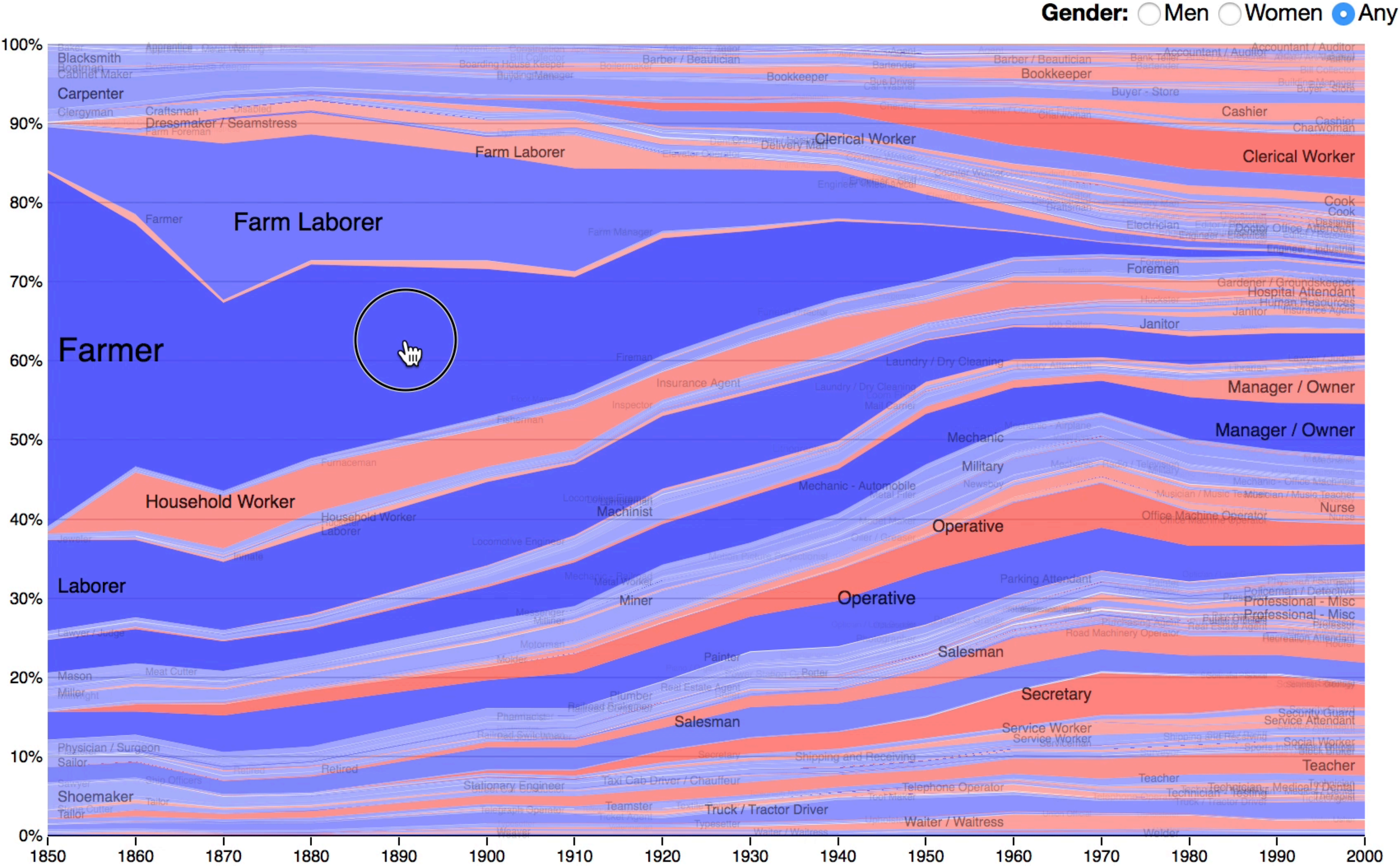
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Job Voyager



search: |



type the digits of a zip code

benfry.com/zipdecode/ tryclassbuzz.com

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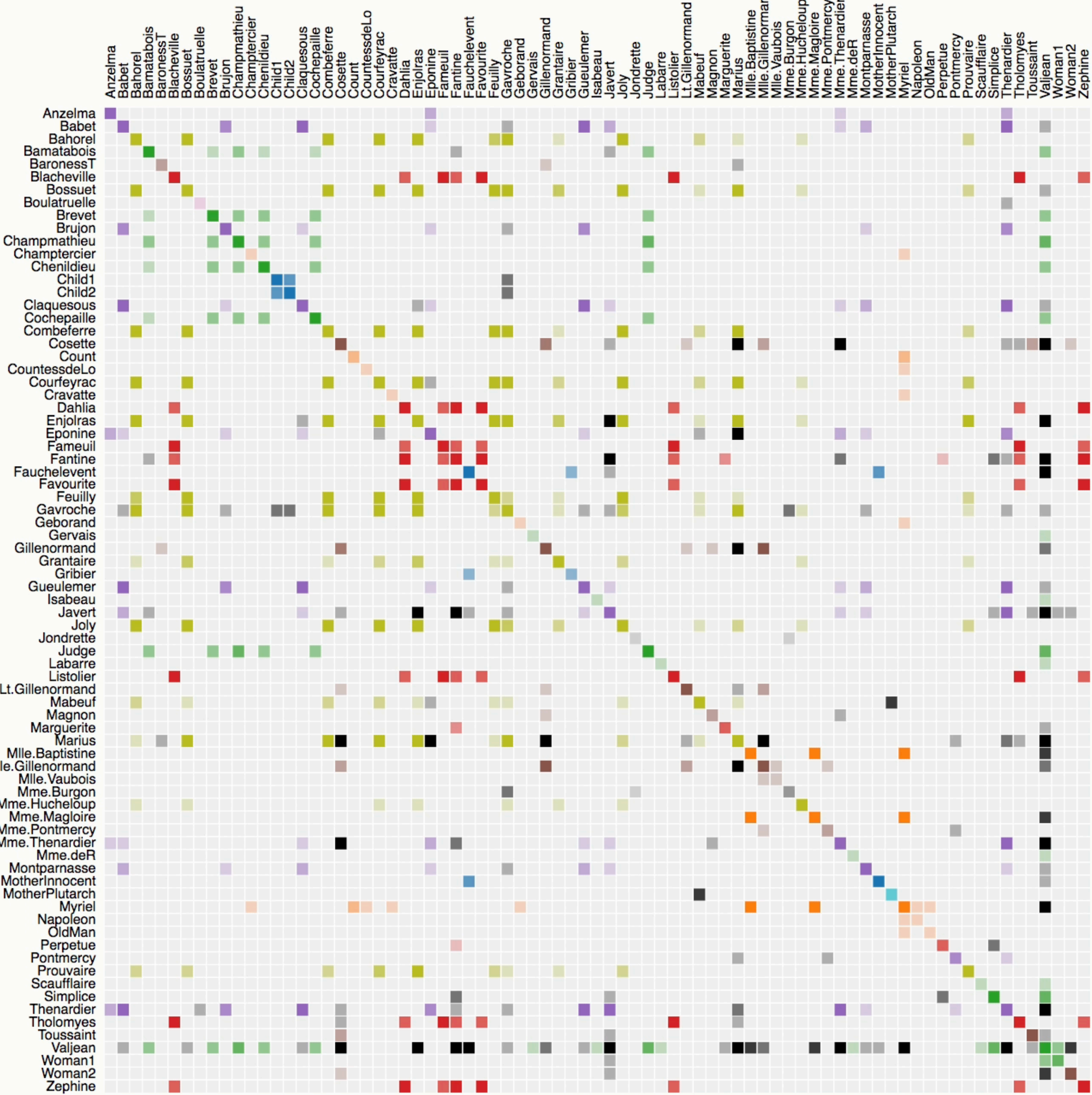
Filter show me more or less detail.

Reconfigure show me a different arrangement.

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Encode show me a different visual representation.

Reconfigure



Order:

This matrix diagram visualizes character co-occurrences in Victor Hugo's *Les Misérables*.

Each colored cell represents two characters that appeared in the same chapter; darker cells indicate characters that co-occurred more frequently.

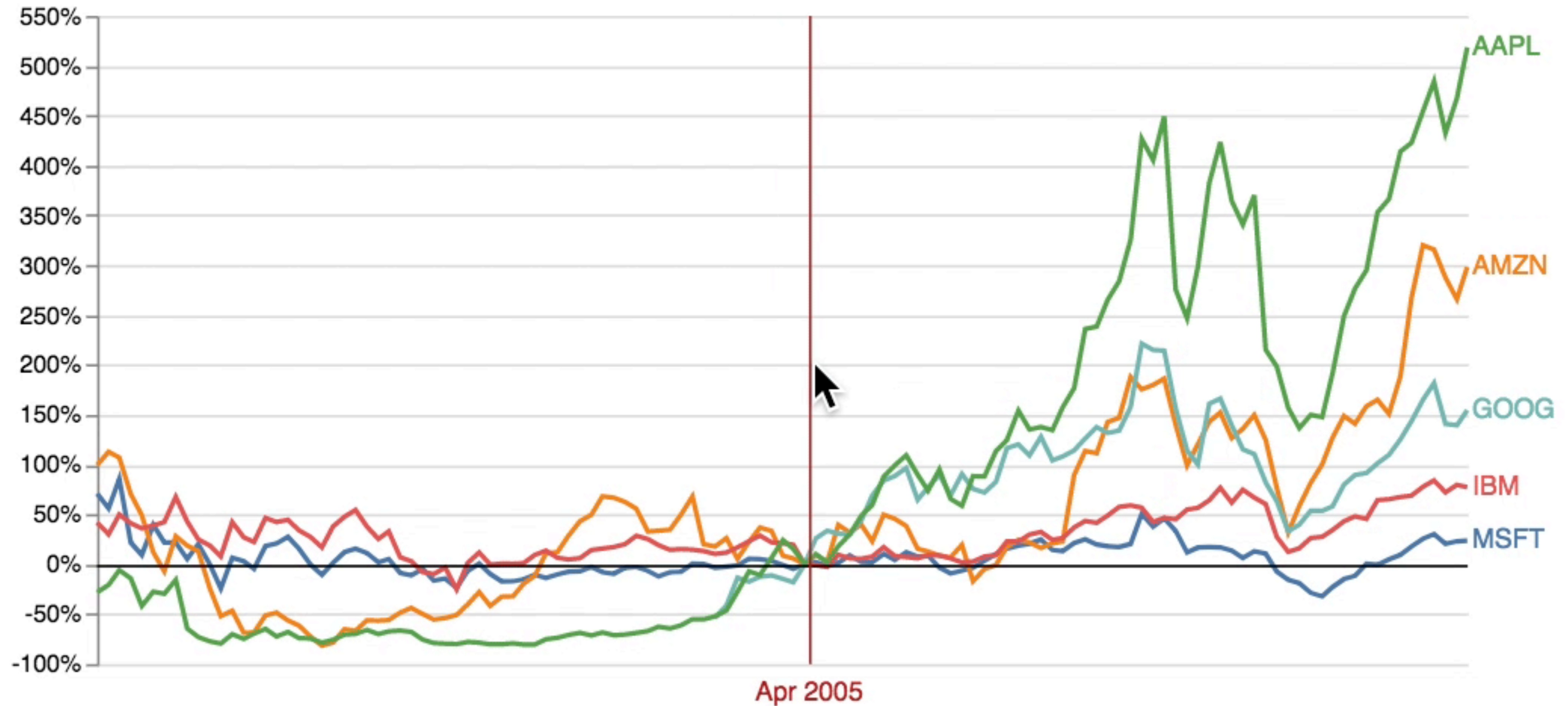
Use the drop-down menu to reorder the matrix and explore the data.

Built with [d3.js](#).

Reconfigure



Reconfigure



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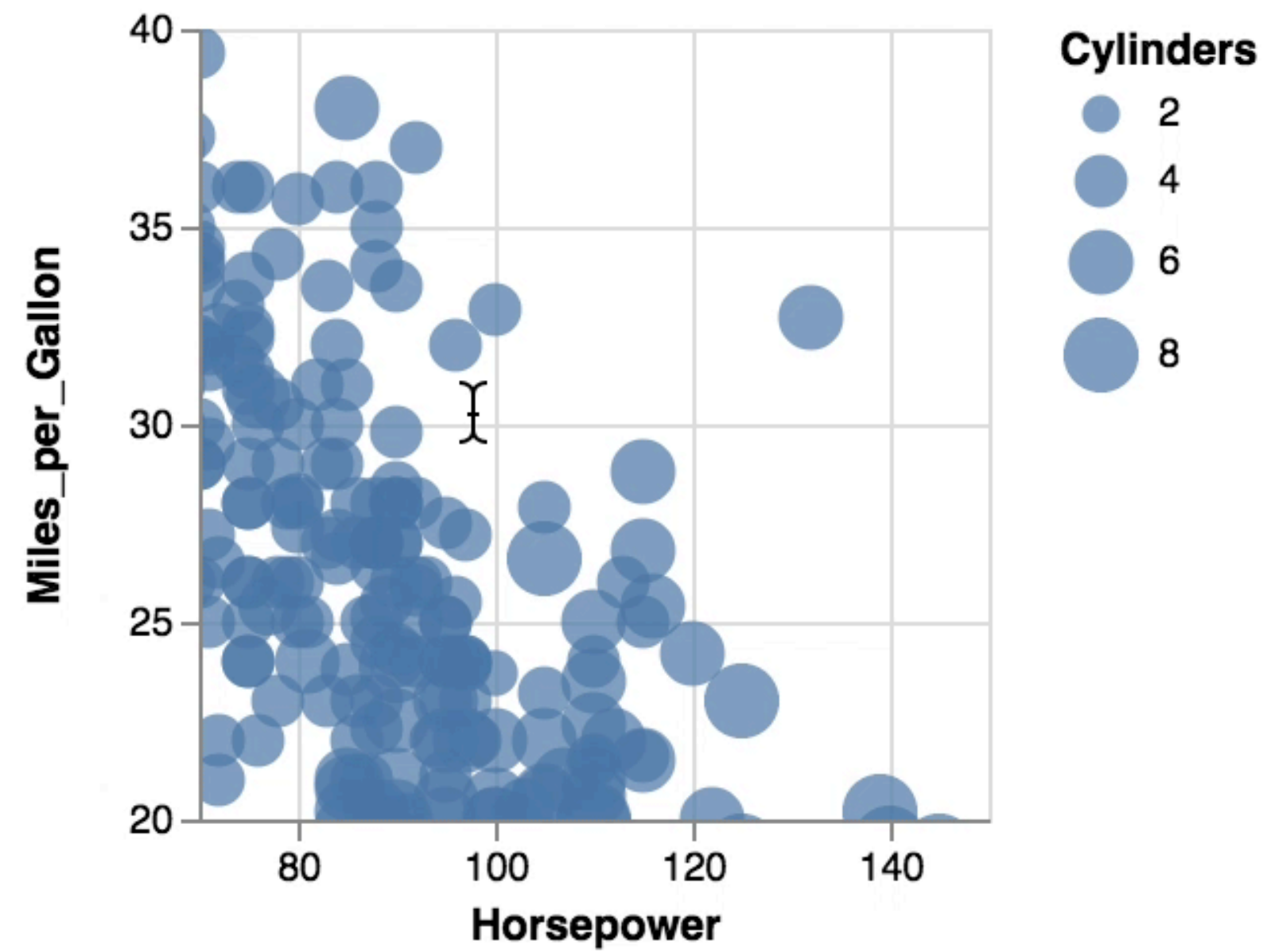
Filter show me more or less detail.

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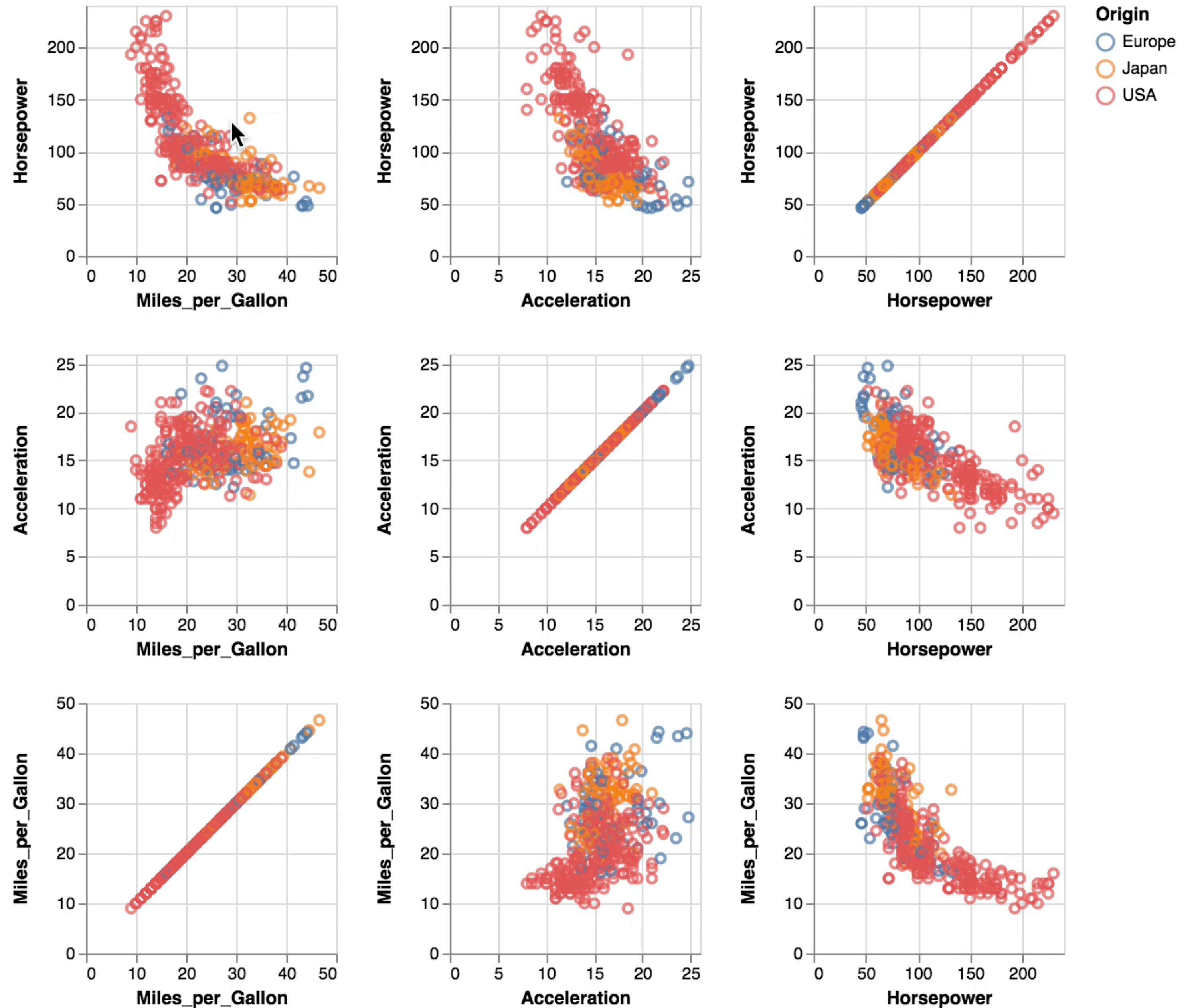
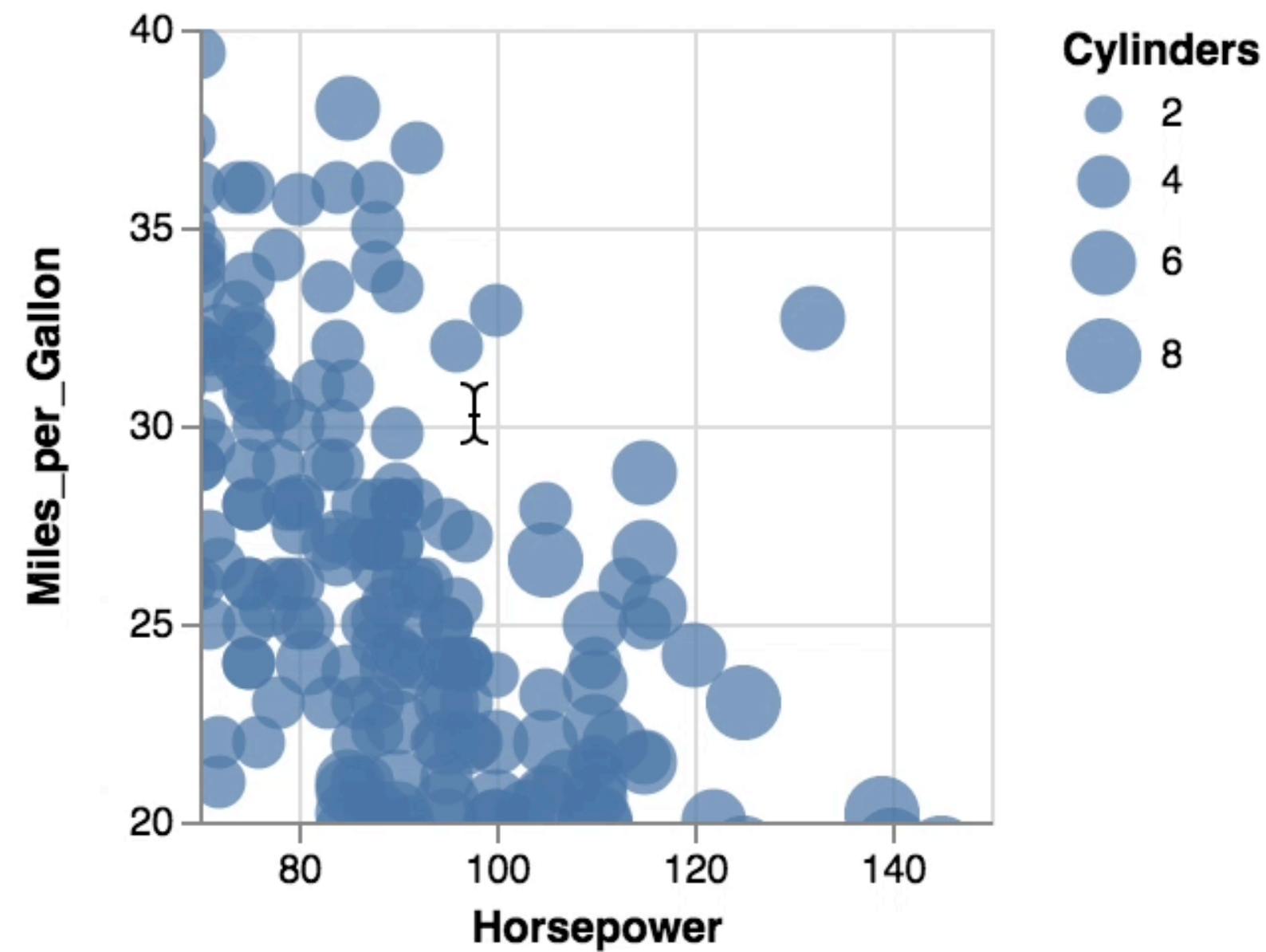
Explore show me something else.

Encode show me a different visual representation.

Explore

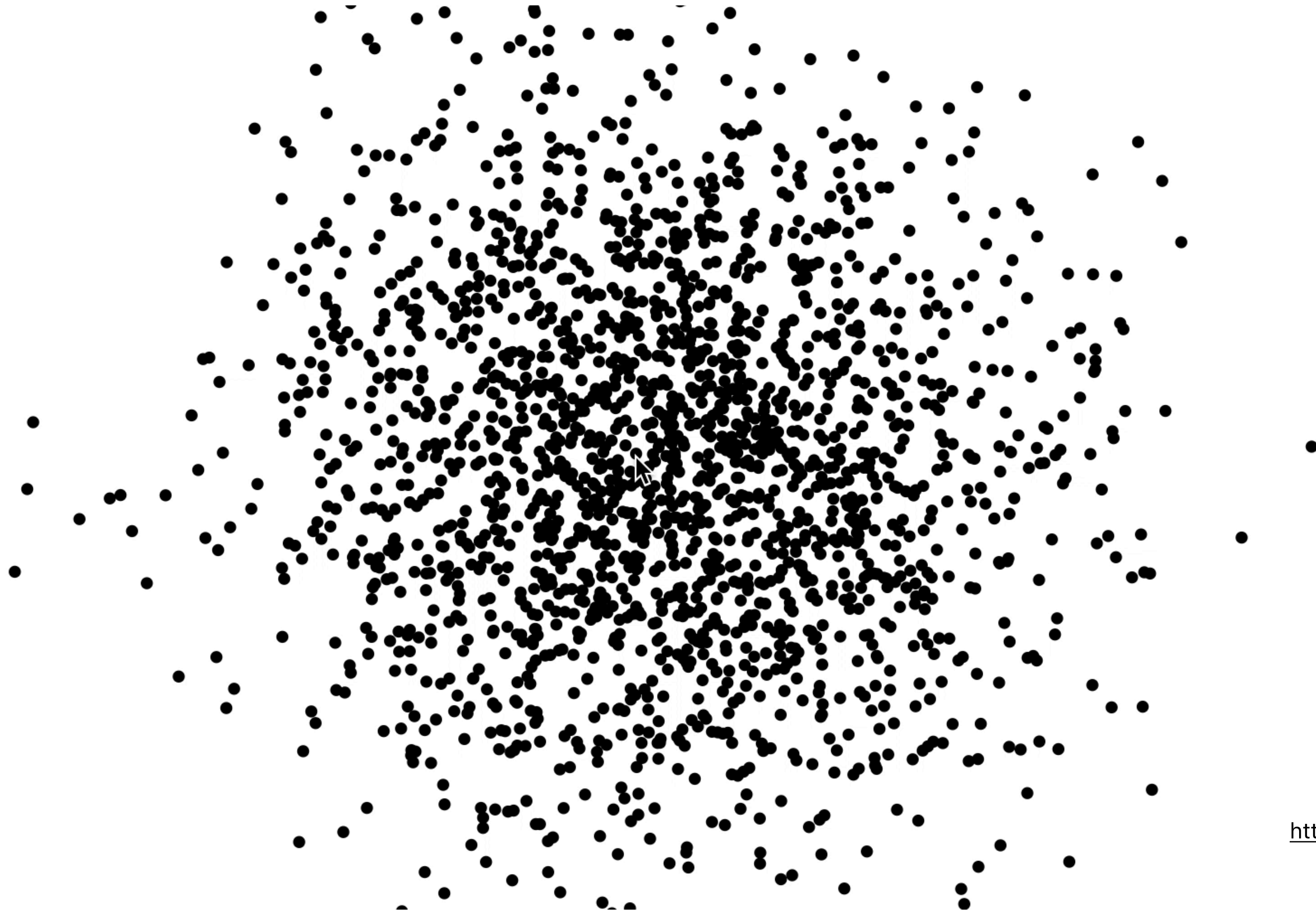


Explore



Explore

Geometric zoom: transforms the physical view (i.e., objects get larger as they get "closer").



<https://bl.ocks.org/mbostock/3680999>

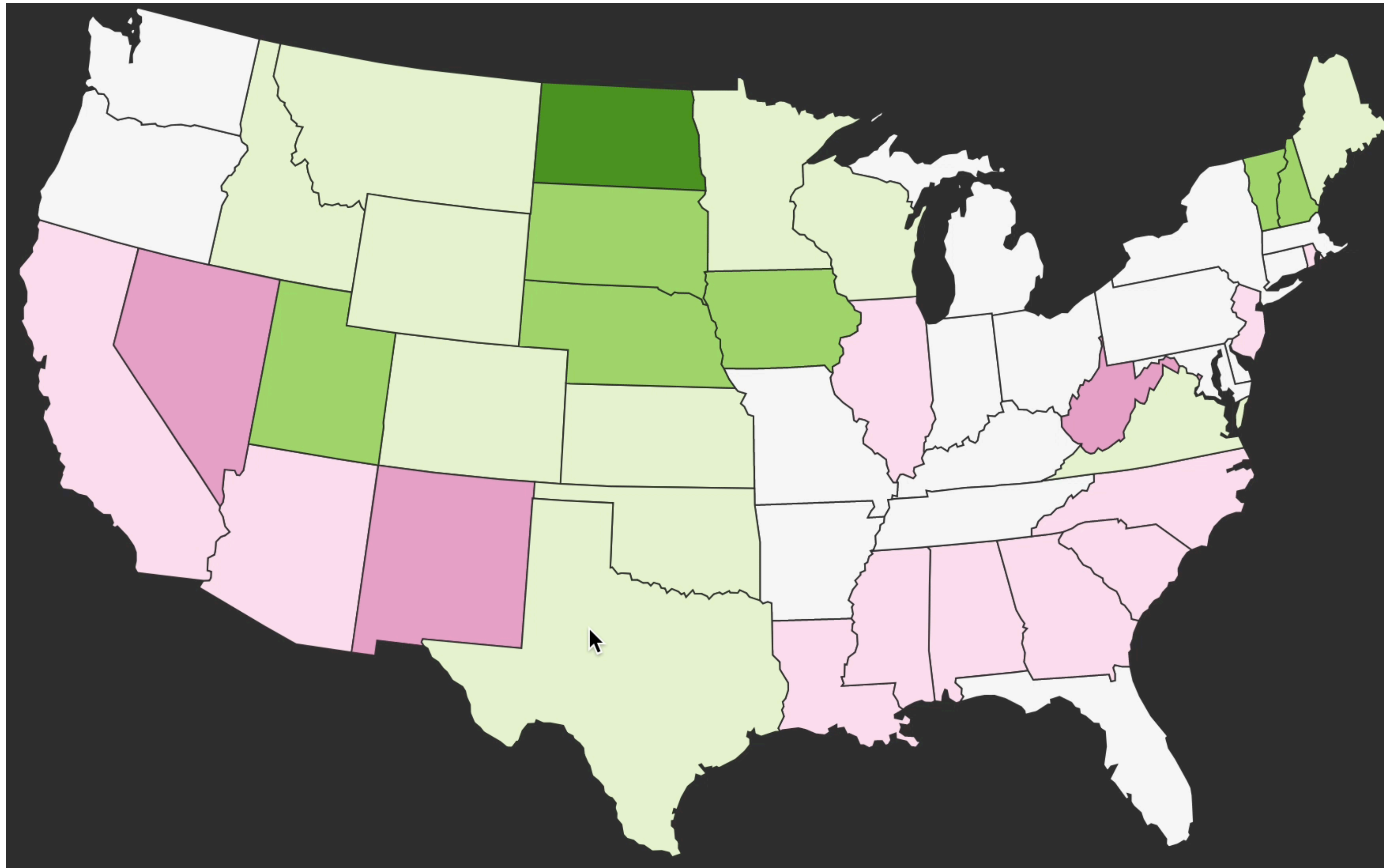
Explore

Semantic zoom: transforms the data space (i.e., objects stay the same size, but get further apart).



Explore

Semantic zoom: transforms the data space (i.e., objects stay the same size, but get further apart).



<https://bl.ocks.org/cmgiven/d39ec773c4f063a463137748097ff52f>

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Encode show me a different visual representation.

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Reconfigure show me a different arrangement.

See interactive systems like Tableau / Voyager

Encode show me a different visual representation.

Interaction in Visualization

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Filter show me more or less detail.

Reconfigure show me a different arrangement.

Explore show me some

Encode show me a dif

**Use interaction to help
audience see something new,
not just for visual eye candy!**